STATE OF ILLINOIS
ADLAI E. STEVENSON, *Governor*
DEPARTMENT OF REGISTRATION AND EDUCATION
C. HOBART ENGLE, *Director*

DIVISION OF THE
STATE GEOLOGICAL SURVEY
M. M. LEIGHTON, *Chief*
URBANA

ILLINOIS PETROLEUM NO. 66

ILLINOIS OIL-FIELD BRINES

THEIR GEOLOGIC OCCURRENCE AND CHEMICAL COMPOSITION

BY

WAYNE F. MEENTS, ALFRED H. BELL,
O. W. REES, AND W. G. TILBURY

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DEPARTMENT OF REGISTRATION AND EDUCATION

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THEIR GEOLOGIC OCCURRENCE AND CHEMICAL COMPOSITION

BY

WAYNE F. MEENTS, ALFRED H. BELL,
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I. INTRODUCTION

Studies of the chemical composition of natural brines have been carried on extensively in many areas. Brine composition was found to vary widely with the stratigraphic position of the containing rock and with depth below the surface for brines occurring at different geographic locations in the same formation.

Brine composition has been important in the determination of the source of brine in oil wells which may have leaking casings. Recently, chemical data have been used increasingly in the quantitative interpretation of electric well logs. The data contained in this report will be of use to oil men concerned with the interpretation of electric logs in Illinois and in water flooding for oil recovery.

The cooperation of the oil companies from whose wells brine samples were obtained is gratefully acknowledged.

II. COLLECTION OF BRINE SAMPLES

BY

WAYNE F. MEENTS and ALFRED H. BELL

In this investigation attempts have been made to obtain brine samples from all producing oil pools in Illinois and from as many different formations in each pool as possible. If samples were not collected, it was almost always because the wells were producing from more than one formation or did not produce brine.

The phrase "oil-field brine" as used herein includes not only brines associated with oil in producing areas, but also a few brines from the same formations in barren areas and from formations which have not yet produced oil in the Illinois region, as for example the St. Peter formation.

The collection of oil-field brines for chemical analysis was begun by the Illinois State Geological Survey in 1924, and until 1931, when the Geological Survey's chemical laboratories were set up, brine analyses were made by the State Water Survey. The results of many of these earlier analyses are given in previous publications (see Part VI, References). The brine samples, analyses for which are reported herein, were collected mainly during the period from 1940 to 1952.

During the course of the brine investigation, the test results of total solids and of various constituents were plotted on maps. By this means it was possible to detect promptly descrepancies in results for brine samples from one vicinity, thus indicating the need to take repeat samples from the same or nearby wells. It was usually found that the first sample was contaminated and not truly representative of the brine in the formation.

A majority of the brine samples from cable-tool wells in the old fields were probably more or less diluted with fresher water from strata higher up in the geologic column. It was therefore decided to omit these analyses from the present report.

METHODS OF COLLECTING SAMPLES OF OIL-FIELD BRINE FOR ANALYSIS

Whenever possible, brine samples were collected from the bleeder valve on the well head. However, for wells which produce practically all oil, this was impossible. Many wells produce only a few gallons of brine to hundreds of barrels of crude oil, and in this situation it is necessary to collect the brine sample from the storage, flow, or heater tanks.

Storage-tank samples are satisfactory provided enough brine is produced each day. For the purpose of this report samples were collected only from storage tanks which received at least one-half barrel of brine per day.

Flow-tank samples are very good when one barrel or more of brine flows through the system a day.

Heater-tank samples were avoided where excessive heat was applied and a small amount of brine was present. Where a large volume of brine passes through the system, the samples were considered good for analysis even though the temperature exceeded 140° F.

To avoid contamination with acid-spent water, no samples were collected immediately after acidization of wells. Brine samples from acidized wells were not used unless the wells had produced 100 barrels or more of brine.

Drill-stem test samples were avoided because they are usually contaminated with water from drilling-mud invasion.

A few brine samples from cable-tool wells are included. So far as possible these are samples from wells which had been cased down to the producing formation, and which were filled with enough water from formation pressure to flush out any drilling mud used in drilling the producing formation.

III. METHODS OF BRINE ANALYSIS

BY

O. W. REES and W. G. TILBURY

Because brines change in composition during standing, certain examinations and determinations are made as soon as the samples reach the laboratory. General examinations made immediately include those for color, odor, turbidity, presence or absence of oil, necessity of filtering, and the type of container in which the sample is submitted.

Immediate analytical determinations include those for total solids, alkalinity, iron, ammonia nitrogen, nitrate nitrogen, and pH. Odor, turbidity, presence of oil, and necessity of filtering are determined on the unfiltered sample. Iron is determined on both unfiltered and filtered samples. Total solids, ammonia nitrogen, nitrate nitrogen, and pH are determined on the filtered sample. The sample is filtered, if necessary, as soon as the observations and determinations on the unfiltered sample have been made. The filtered sample is then used for the more complete analysis of the brine.

In addition to these immediate determinations, the brines are analyzed for silica, manganese, calcium, magnesium, sodium and potassium combined (by difference), sulfate, and chloride.

CONDITION OF THE SAMPLE

1. The apparent color of the sample is recorded as clear, reddish, blackish, etc.

2. The odor of the unfiltered sample is recorded as oily, musty, or like hydrogen sulfide, etc.

3. The turbidity is reported as absent, slight, heavy, etc.

4. The presence or absence of oil is recorded.

5. If the sample contains oil or suspended matter, the necessity for filtering is recorded.

6. The type of container in which the sample is submitted is recorded.

CHEMICAL ANALYSIS

1. *pH.* — pH is determined by electric pH meter.

2. *Total solids.* — Total solids are determined gravimetrically: 50 ml. of brine is evaporated in a weighed Pyrex dish, dried at a constant temperature of 180° C. for one hour, cooled in a desiccator, and weighed. This residue is weighed immediately as it picks up moisture from the atmosphere. The weight of the residue in milligrams multiplied by 20 gives p.p.m. of total dissolved solids.

3. *Alkalinity, volumetric.* — 50 ml. of the brine is titrated with N/50 H_2SO_4 to a phenolphthalein end-point if the addition of the indicator produces a red color. Methyl orange is added to the same portion of sample and titration continued to the methyl orange end-point. The methyl orange titration in p.p.m. $CaCO_3$ is equal to the number of ml. N/50 H_2SO_4 multiplied by 20. This value is the total alkalinity expressed as $CaCO_3$. The phenolphthalein titration gives one-half the normal carbonate and all the hydroxide present. Titration to the methyl orange end-point gives total hydroxide, normal carbonate, and bicarbonate. The results are expressed as p.p.m. $CaCO_3$ for the purpose of making hypothetical combinations and are also expressed as p.p.m. of hydroxide, normal carbonate, and bicarbonate in the ionic report. The ionic results are calculated from the alkaline titrations. If the phenolphthalein alkalinity is greater than one-half the methyl orange alkalinity, normal carbonate and hydroxide are present; if exactly equal to one-half the methyl orange alkalinity, normal carbonate; if less than one-half, normal carbonate and bicarbonate. On the basis of these considerations, therefore, p.p.m. of hydroxide, carbonate, and bicarbonate are calculated by determining the equivalents of each and multiplying by the equivalent weights of each ion.

4. *Iron, colorimetric.* — Iron is determined on a 50 ml. sample or adequate dilution thereof. The iron is completely oxidized to the trivalent state in HCl solution by the addition of potassium permanganate, and potassium thiocyanate is added to produce a brownish-red color which is compared with appropriate standards made up in the same way from a standard iron solution. P.p.m. of iron as Fe are calculated by using the formula:

$$\text{ml. reading} \times \text{mg.Fe/ml. standard} \times \frac{\text{total vol.}}{\text{vol. read}} \times \frac{1000}{\text{original vol.}}$$

To obtain this value as iron oxide (Fe_2O_3), the value is multiplied by the factor 1.4297.

5. *Ammonia nitrogen, colorimetric.* — 50 ml. of the sample diluted to 500 ml. is distilled with sodium hydroxide and 200 ml. of the distillate collected. Aliquot portions of the distillate are pipetted into Nessler tubes and nesslerized. Comparison is made in a comparator with a standard NH_4-Cl solution, which is made up in terms of mg. N, and the formula

$$\text{ml. reading} \times \text{mg. N/ml. standard} \times \frac{\text{total vol.}}{\text{vol. read}} \times \frac{1000}{50}$$

is used to calculate p.p.m. of ammonia nitrogen.

6. *Nitrate nitrogen, reduction method.* — A 50 ml. sample is concentrated by boiling with NaOH to dispel ammonia. The nitrate present is reduced with aluminum metal. The solution is transferred to a Kjeldahl distilling flask, diluted to approximately 300 ml. and distilled, 200 ml. of the distillate being collected. Aliquot portions of the distillate are pipetted into Nessler tubes and nesslerized as in the ammonia nitrogen determination.

7. *Chlorides.* — Chlorides are determined both gravimetrically and volumetrically. They are determined by the Volhard method by precipitation with standard silver nitrate solution, filtration, drying, and weighing of precipitated silver chloride and titration of excess silver nitrate with standard potassium thiocyanate. Volumetric and gravimetric results should check to 0.4 percent or less.

Chloride values for oil-field brines run approximately 60 percent of the total solids value in p.p.m. This figure is used in estimating the appropriate dilution of sample to be made for the determination. A sample portion is used which yields approximately 0.3 g. of AgCl. The following dilutions are used:

Approximate Cl p.p.m.	*Dilution* ml:ml	*For Analysis* ml.	*Multiplier*
up to 1600	none	50	20
1700 – 3200	none	25	40
3300 – 8000	100 – 500	50	100
9000 – 16000	50 – 500	50	200
17000 – 32000	50 – 1000	50	400
33000 – 64000	50 – 1000	25	800
65000 – 120000	50 – 1000	25	800

8. *Complete minerals, general.* — The analysis for complete minerals includes the determination of silica, ferric and aluminum oxides, calcium, magnesium, and sulfate. Silica is determined gravimetrically in two 50 ml. portions of sample. The silica in both portions is dehydrated by evaporation to dryness with HCl in platinum dishes. The dehydrated residue is taken up in hot 1:1 HCl, and washed by decantation with hot 1:1 HCl, until only the silica remains. This is transferred to the filter paper and washed well with hot water. The two portions are ignited together in a platinum crucible and weighed. The ignited residue is treated with HF and H_2SO_4, reignited, and the weight of silica is obtained by loss in weight.

Ferric and aluminum oxides (R_2O_3) are determined gravimetrically in the filtrates from the silica determination after oxidation of the iron to the trivalent state with bromine water. The solutions are made alkaline to methyl red with NH_4OH, allowed to digest hot for a few minutes and filtered. The R_2O_3 precipitates are washed well with hot water and ignited together. The residue is weighed and then treated with HF and H_2SO_4 to volatilize the silica which escaped the first separation. The filtrates from the R_2O_3 determination serve different purposes from this point on. One is used for the gravimetric determinations of calcium and magnesium, the other for the gravimetric determination of sulfate. One is made alkaline with NH_4-OH and the calcium precipitated as the oxalate. A double precipitation is carried out to minimize the error introduced by the occlusion of magnesium oxalate in the precipitate. The calcium oxalate is ignited to the oxide and weighed.

Magnesium is determined on the total filtrate from the calcium determination by precipitating it as magnesium ammonium phosphate in the usual way. Here, too, a double precipitation is carried out. The precipitate is filtered, washed with 1:20 NH_4OH, ignited to the pyrophosphate and weighed.

The sulfate determination is made on the other filtrate from the R_2O_3 determination. Sulfate is determined in the usual way by precipitation as $BaSO_4$ which is ignited and weighed.

9. *Manganese, colorimetric.* — 50 ml. of the sample is evaporated to dryness with 15 ml. of conc. H_2SO_4 to remove the chlorides as HCl. A few ml. of HNO_3 is added at this point if any carbon is present. The residue is taken up with distilled water and filtered, the salts being leached several times with hot water. 1 ml. of conc. HNO_3 is added to the filtrate, which is heated almost to boiling. A 1 ml. excess of $AgNO_3$ solution and approximately 0.5 g. $(NH_4)_2S_2O_8$ (ammonium persulfate) is added. The solution is heated almost to boiling and kept hot for 10 minutes to produce the full permanganate color. The color is compared with appropriate standards made up from a standard manganese solution and treated exactly like the unknown. Comparisons are made in 50 ml. Nessler tubes in a comparator. Using a 50 ml. sample, the standard reading multiplied by 20 gives p.p.m. Mn. The factor for converting Mn to MnO is 1.2912.

10. *Sodium calculation.* — Upon completion of these determinations the positive ion values expressed as milliequivalents are summed up, also the negative ion values expressed as milliequivalents. The sum of the negative milliequivalents minus the sum of the positive milliequivalents gives a value which is reported as milliequivalents of sodium (combined sodium and potassium). This multiplied by the equivalent weight of sodium gives p.p.m. of sodium and potassium expressed as sodium.

IV. BRINE COMPOSITION IN RELATION TO GEOLOGIC OCCURRENCE

BY

ALFRED H. BELL and WAYNE F. MEENTS

The results of chemical analyses of Illinois oil-field brines are given in Part V. They are arranged by formations (see figure 1 for generalized geologic column) from the top down and under each formation alphabetically by counties and numerically by townships. So far as possible, all analyses have been omitted which later work indicated to be unrepresentative of the brine in the formation.

The samples from formations from the Pennsylvanian down to the Silurian are nearly all from oil-producing wells. Oil-producing areas in Illinois are shown in figure 3. All the brine samples from nonproducing areas are from cable-tool wells, as it is generally impossible to collect good brine samples from rotary wildcat wells during drilling.

Isocon maps, or contour maps of total dissolved minerals, are shown by formations in figures 4, 5, 6, 7, 8, 9, 11, 12, and 13. Most of these show similar patterns of variations which conform rather closely with the basin structure (fig. 2), the lower concentrations being on the margins, and the higher concentrations being in the deeper part of the basin. For most formations, the highest brine concentrations are to the west of the structurally lowest part of the basin. The most abundant data are for the Ste. Genevieve formation (fig. 9).

The concentration of sulfate ion in Ste. Genevieve brines is shown by contours in figure 10. Here the pattern of variation is less distinct than for total solids, but there seems to be some relationship with the basin structure.

Because the thirty analyses of brine from the Pennsylvanian system given in Part V are from scattered areas in southern Illinois and from several different sandstone beds, an isocon map of Pennsylvanian brines is not included. Total solids vary from a low of 11,626 p.p.m. in Clark County to a high of 55,300 p.p.m. in Wabash County.

Analyses of brine from the Degonia and Palestine formations in the Chester series are too few and scattered to permit the preparation of isocon maps.

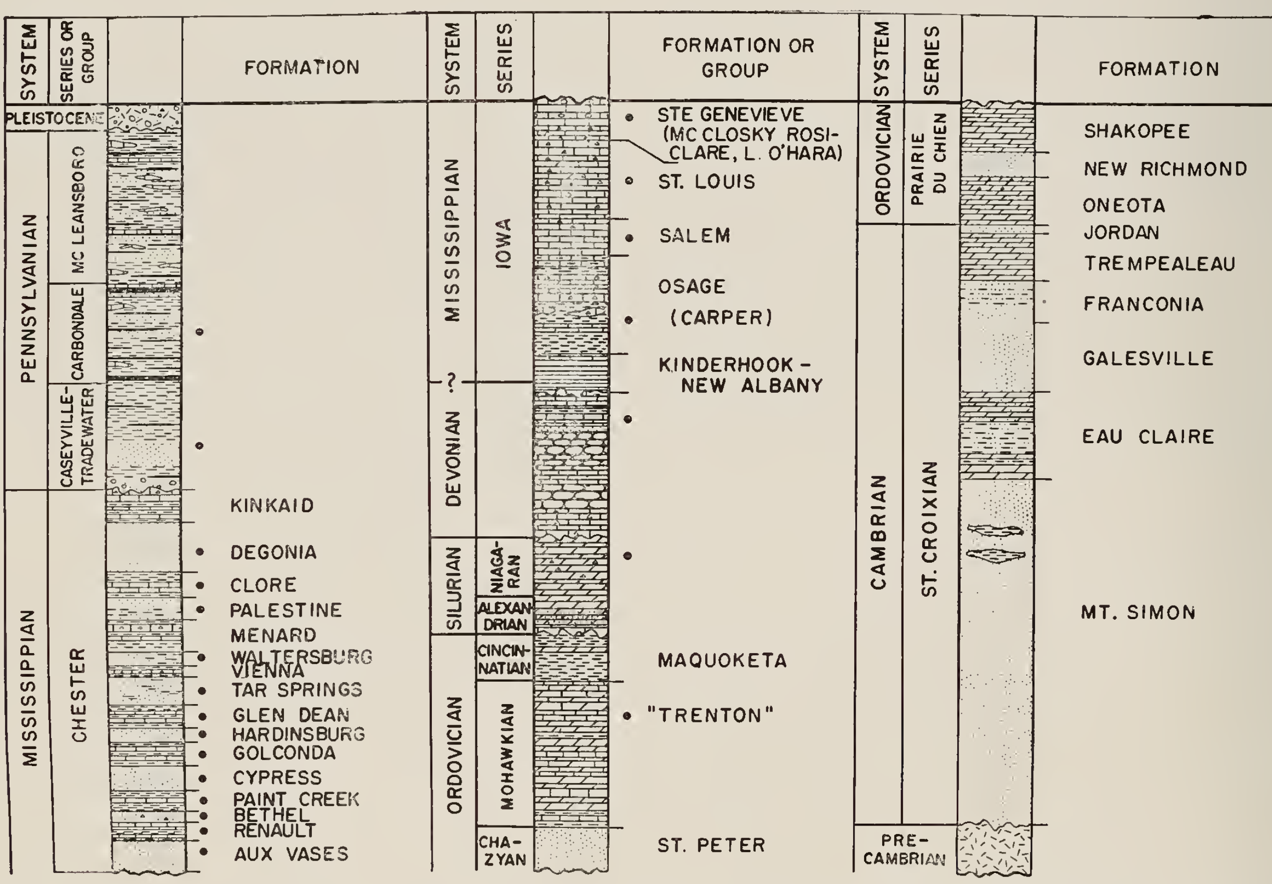

Fig. 1.—Generalized geologic column for southern Illinois oil region. Black dots indicate principal oil- and gas-producing strata. (Same as fig. 3 in Illinois Petroleum 62.)

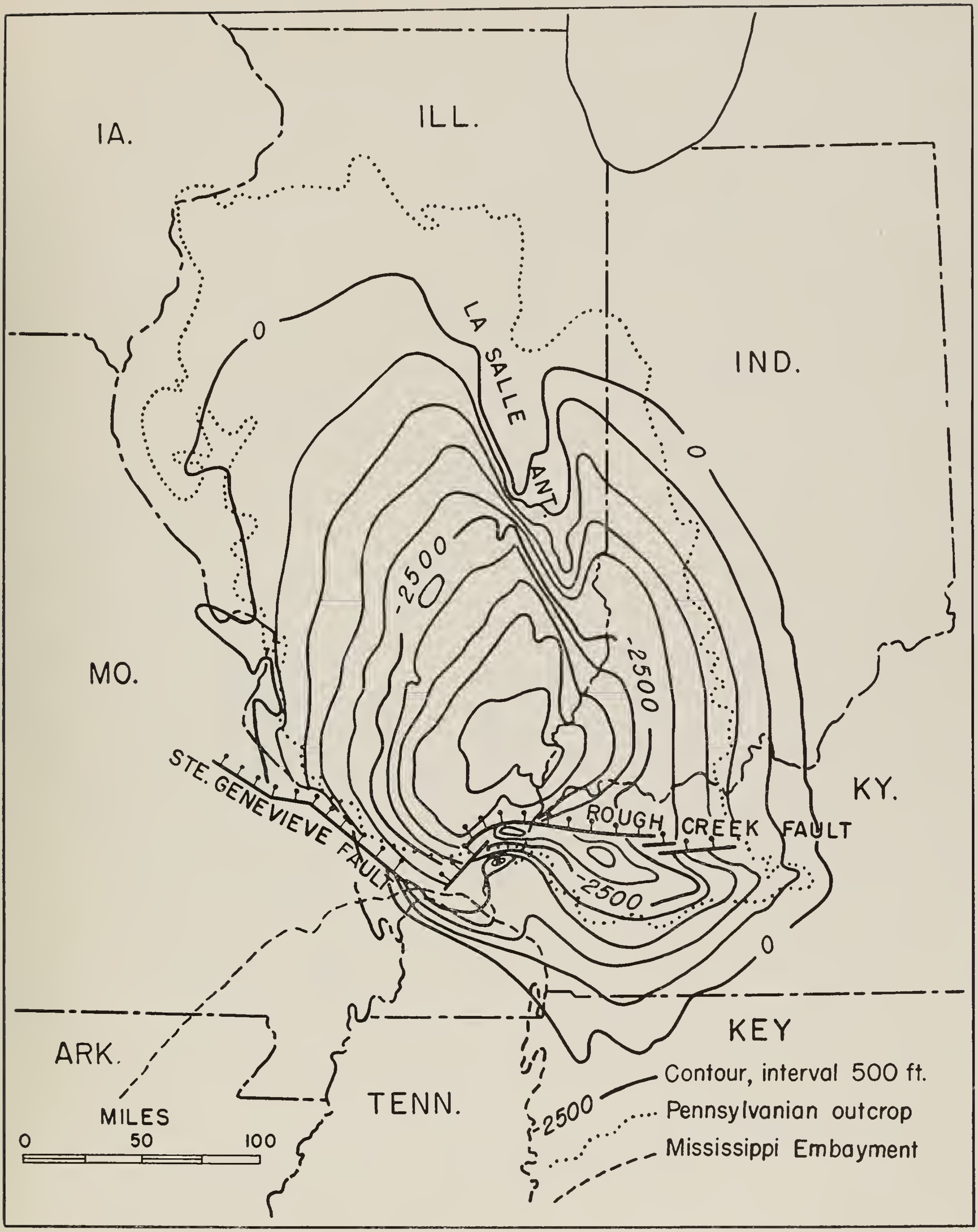

FIG. 2.—Geologic structure of Eastern Interior basin drawn on base of New Albany black shale (top of Devonian limestone or older beds). (Fig. 146, p. 487, Illinois Geol. Survey Circ. 169, and Bull. A.A.P.G., Feb. 1951.)

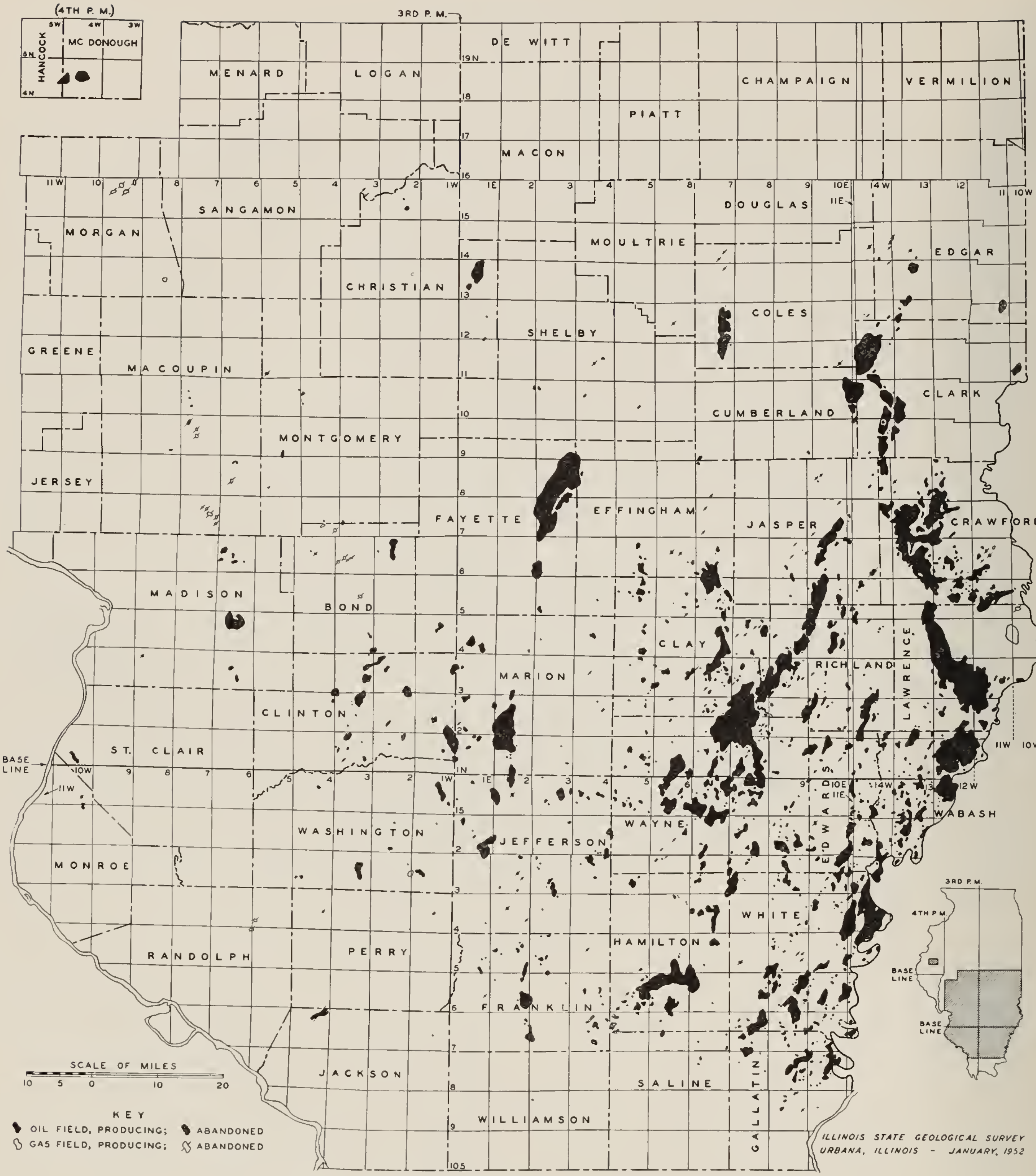

FIG. 3.—Oil- and gas-producing areas in Illinois, Jan. 1952.

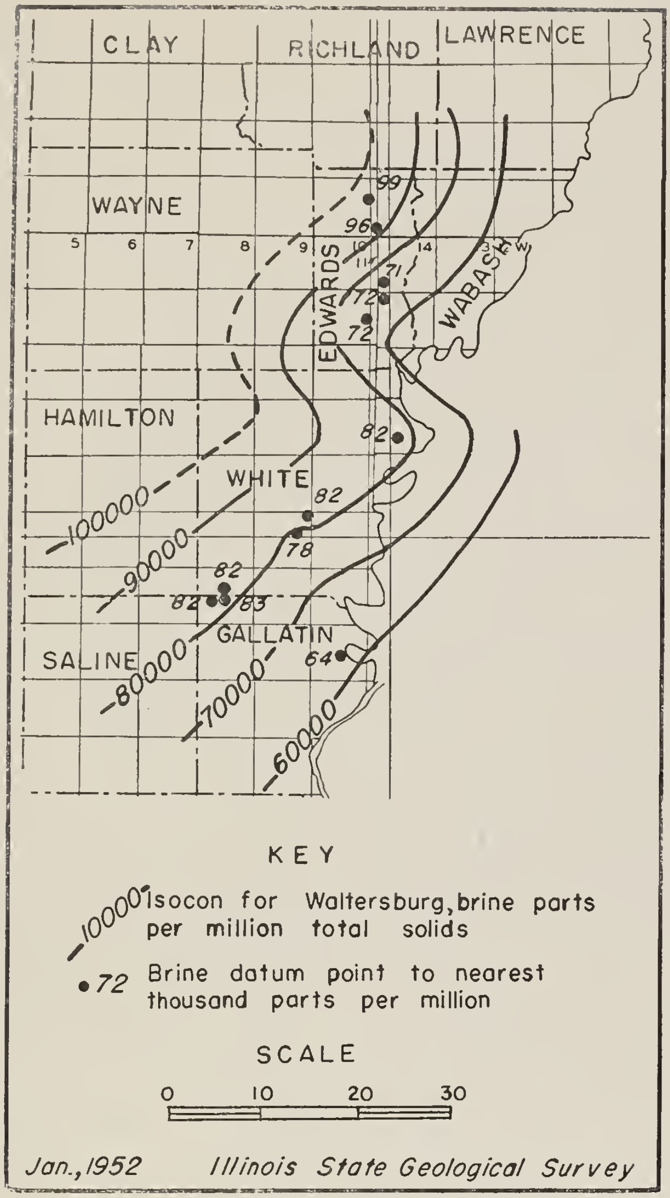

FIG. 4.—Isocon map of Waltersburg brines.

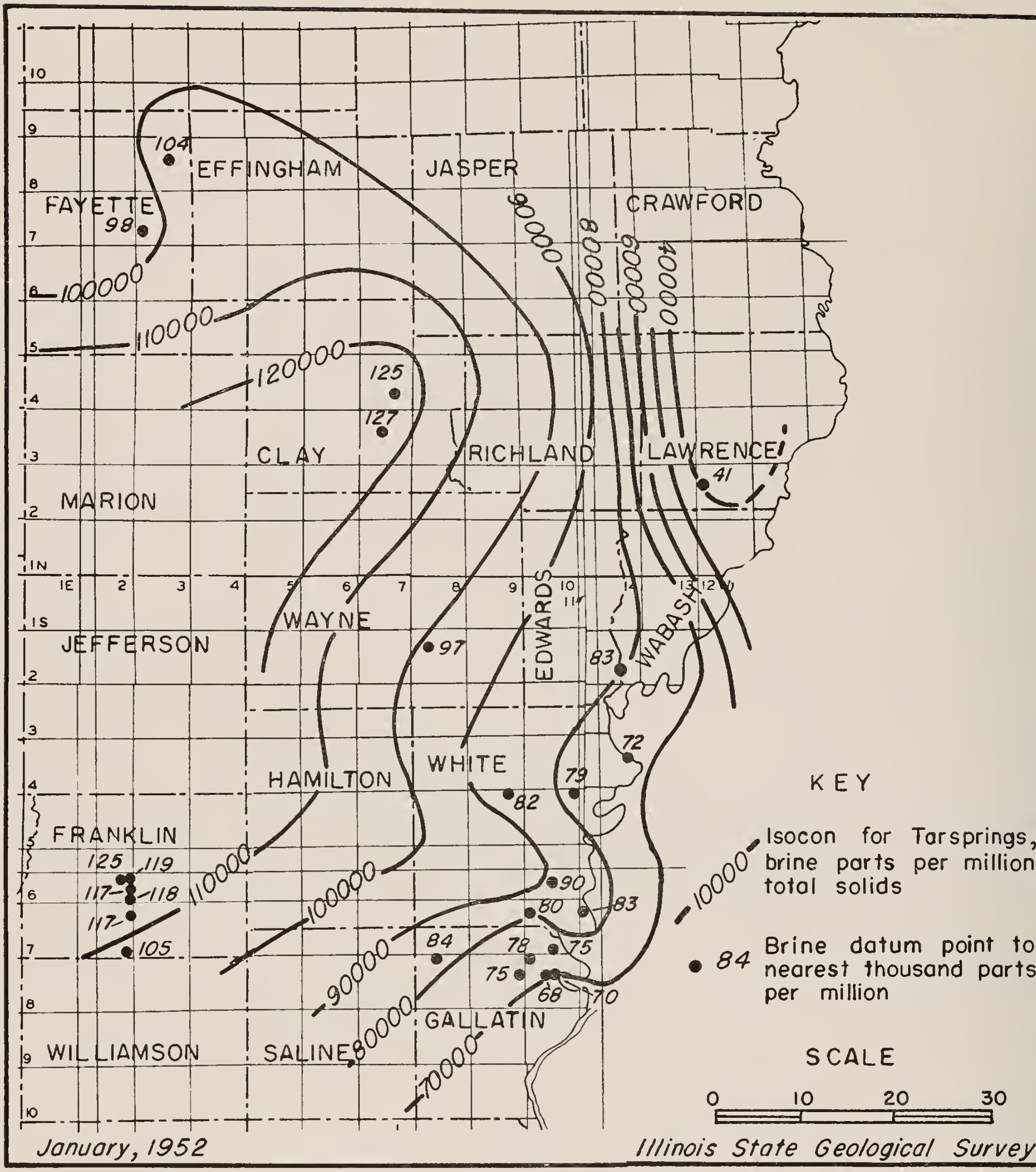

FIG. 5.—Isocon map of Tar Springs brines.

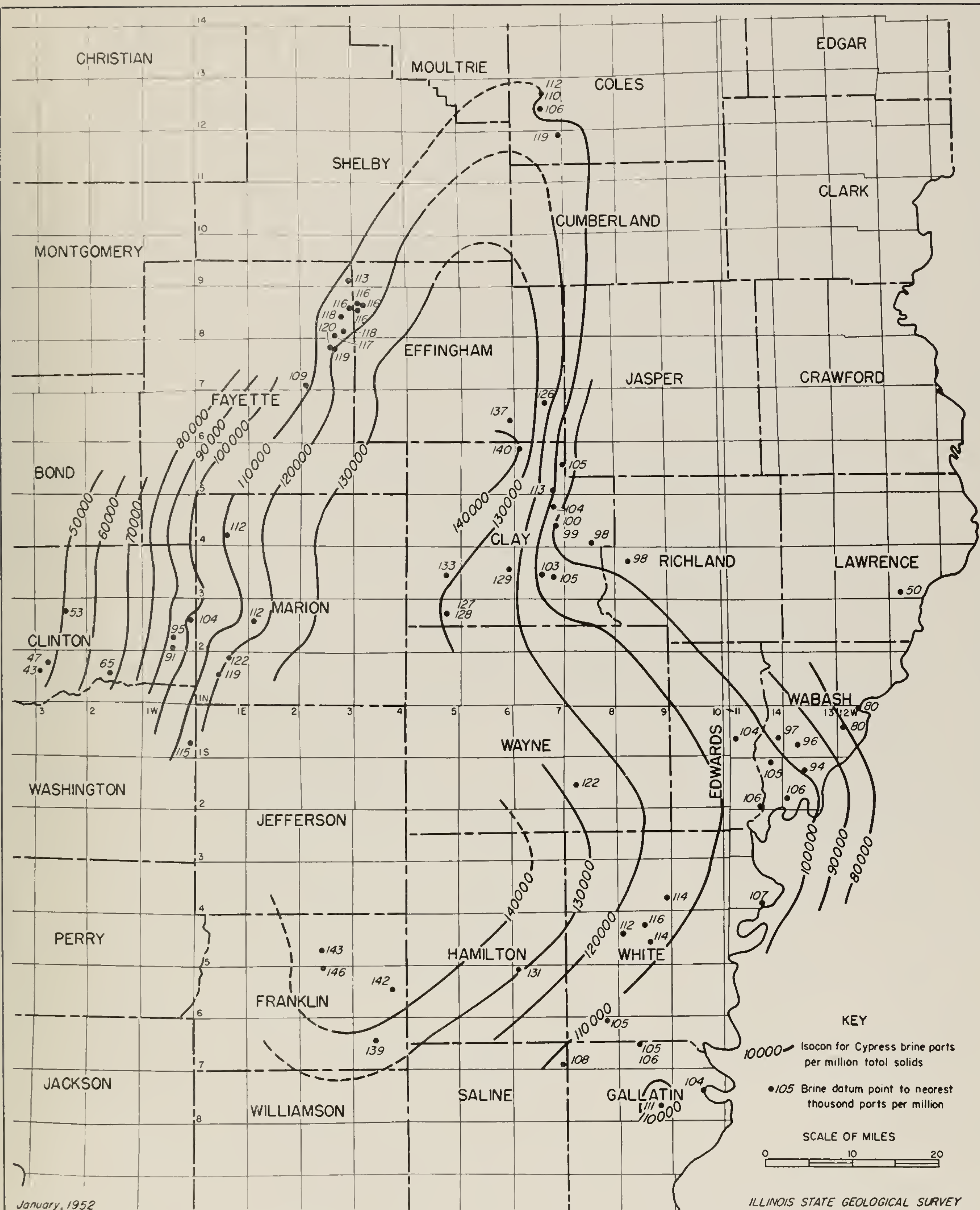

FIG. 6.—Isocon map of Cypress brines.

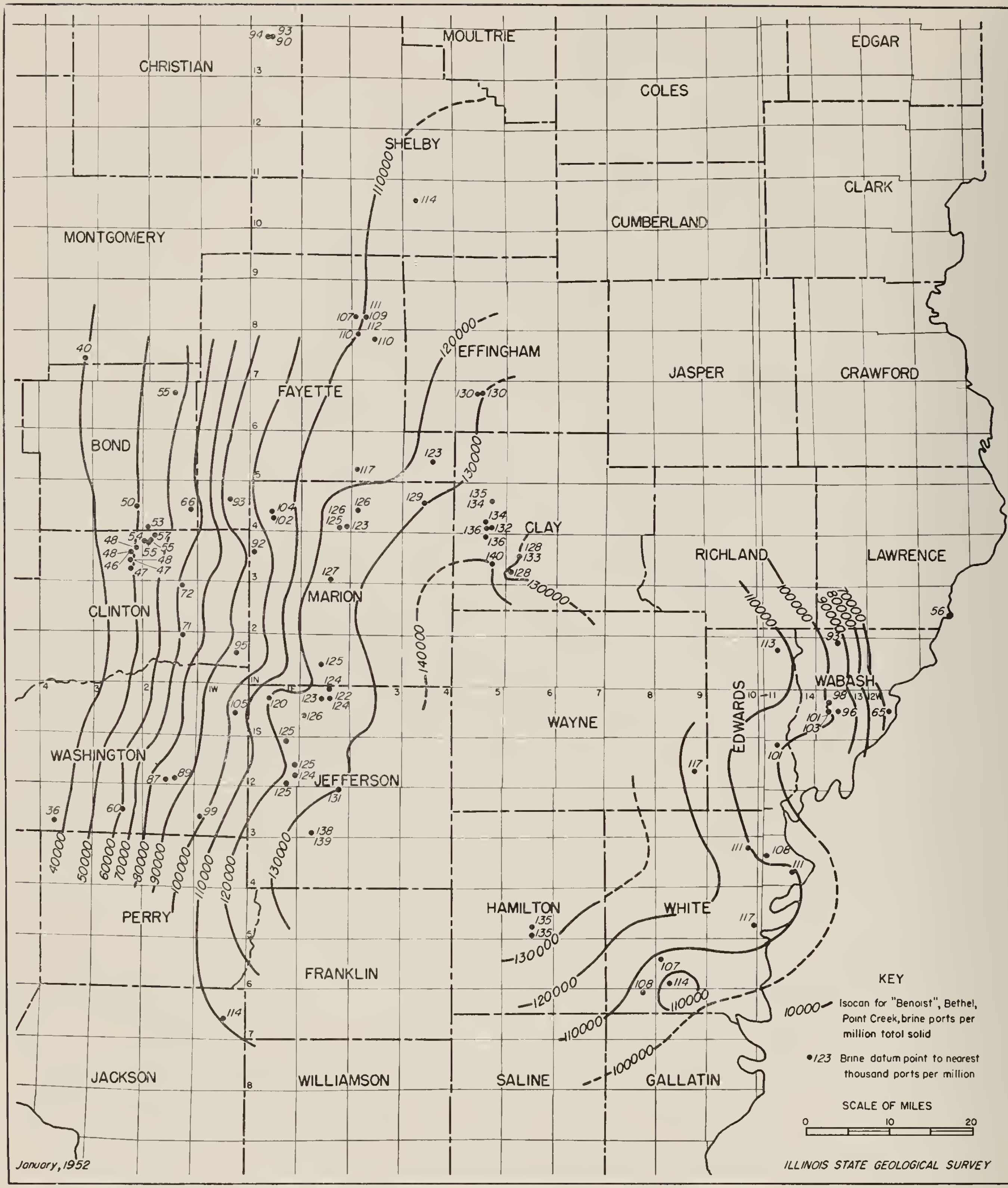

FIG. 7.—Isocon map of "Benoist," Bethel, and Paint Creek brines.

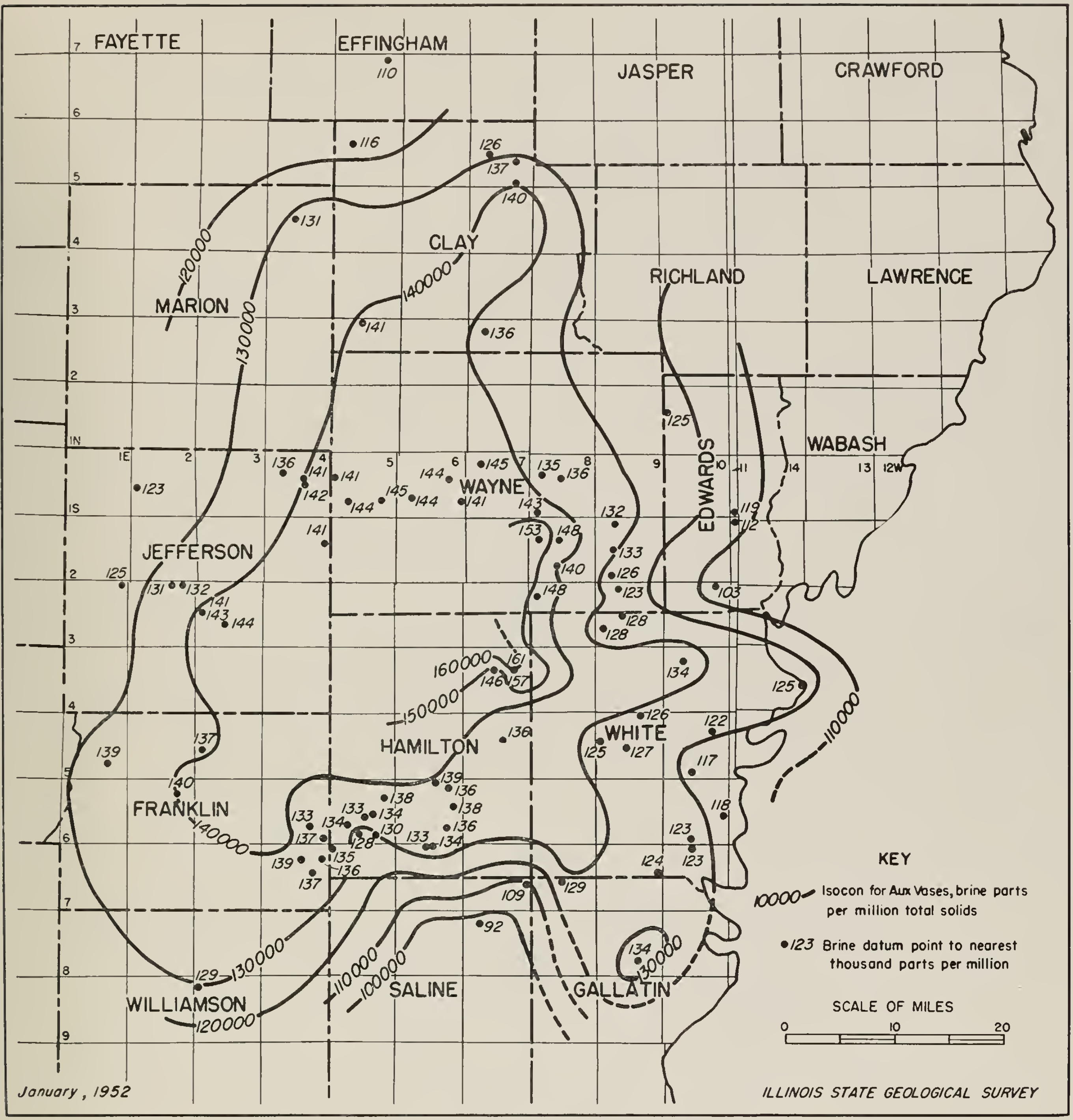

FIG. 8.—Isocon map of Aux Vases brines.

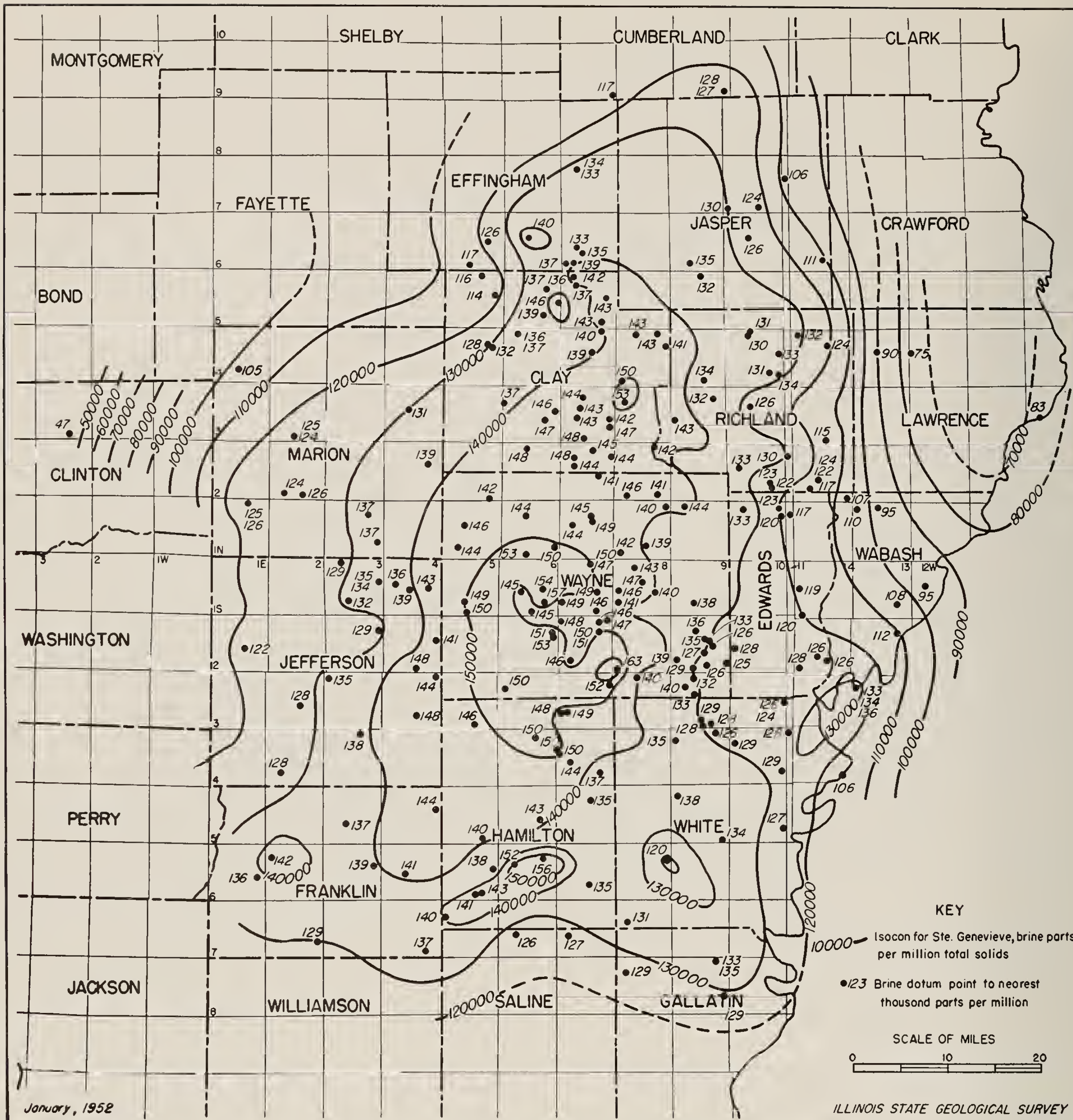

Fig. 9.—Isocon map of Ste. Genevieve brines.

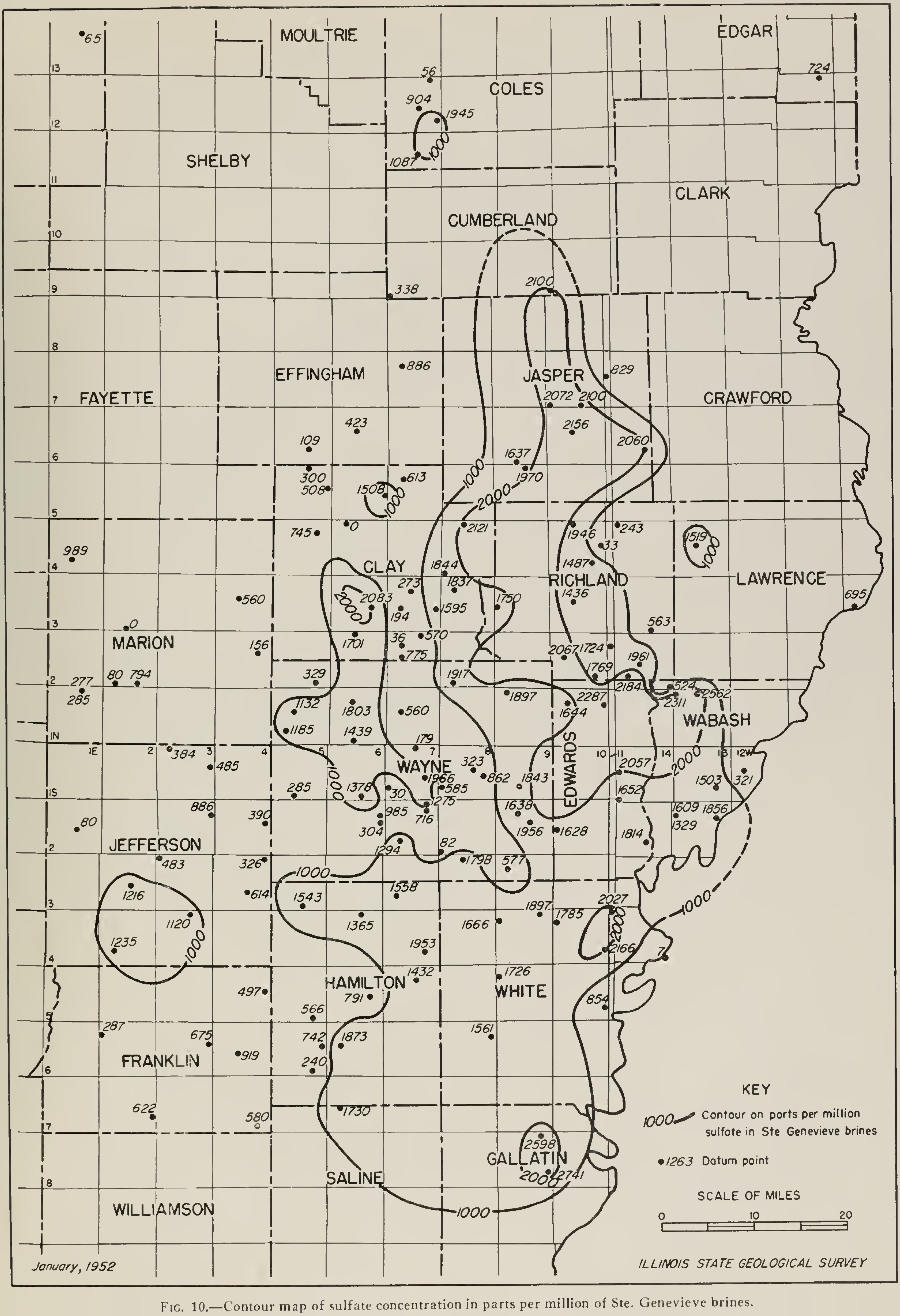

FIG. 10.—Contour map of sulfate concentration in parts per million of Ste. Genevieve brines.

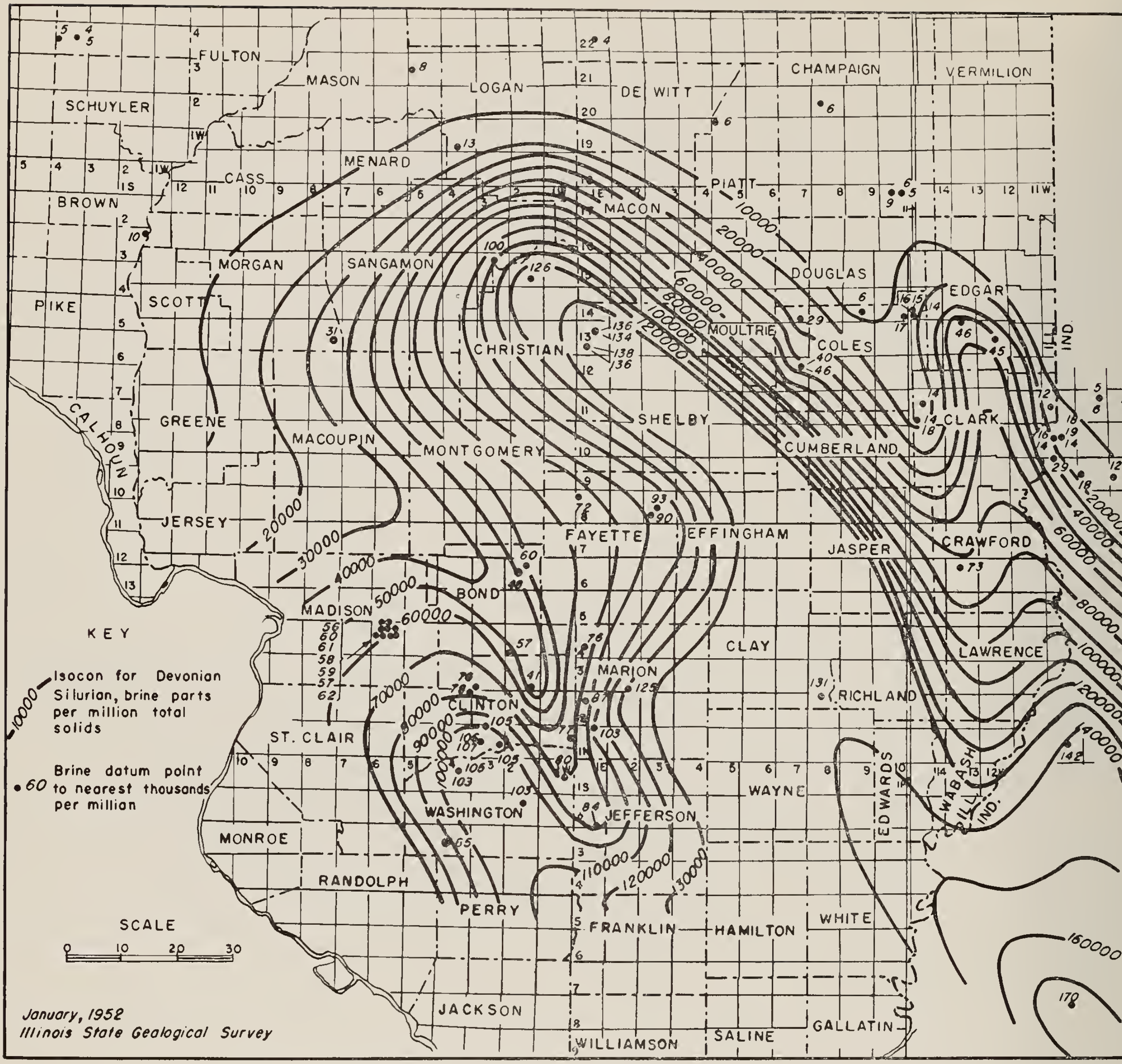

FIG. 11.—Isocon map of Devonian-Silurian brines.

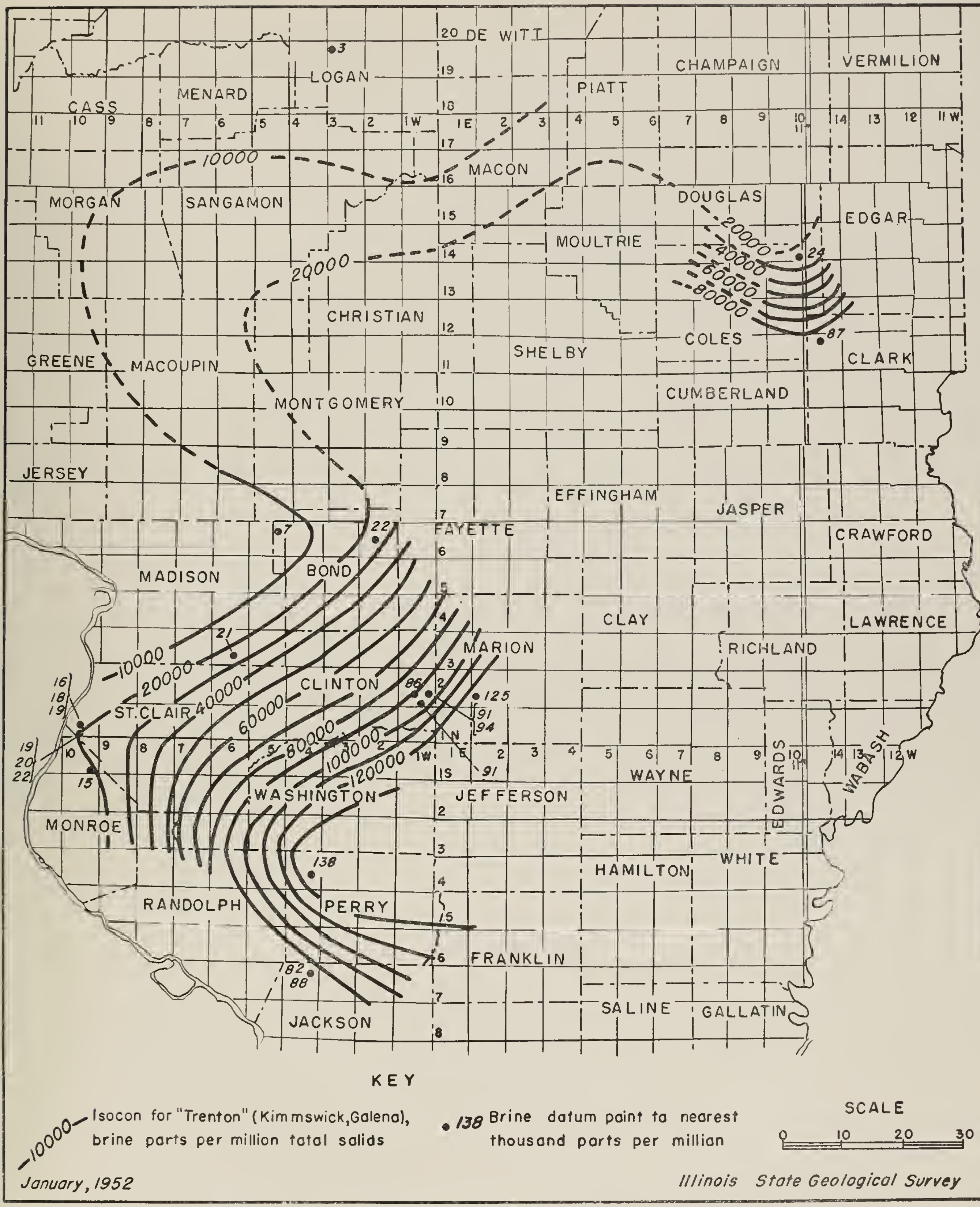

FIG. 12.—Isocon map of "Trenton" (Kimmswick, Galena) brines.

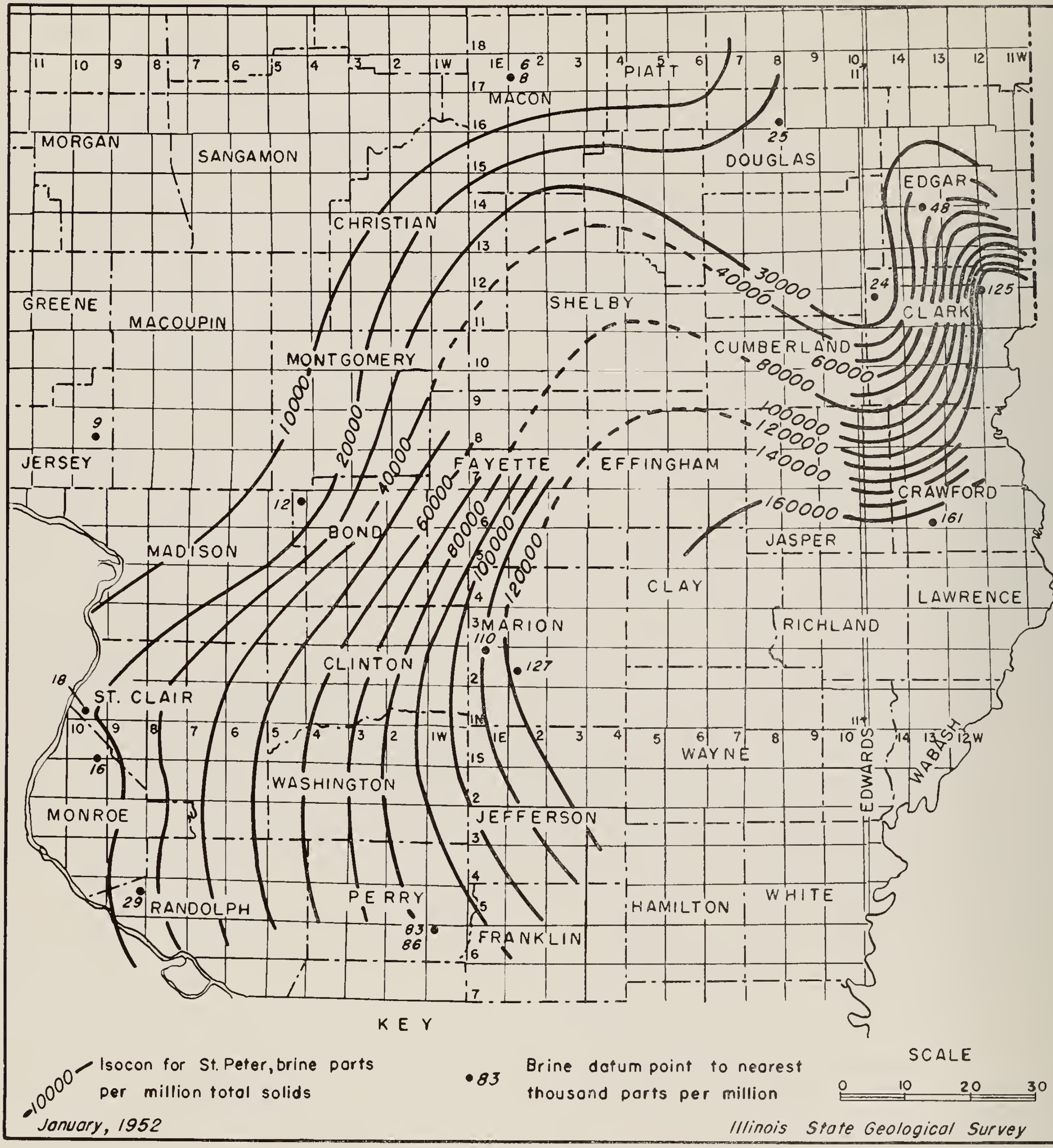

FIG. 13.—Isocon map of St. Peter brines.

V. BRINE ANALYSES

Table 1.—ILLINOIS OIL-FIELD BRINES BY FORMATION

Total Solids and Constituents in Parts Per Million

FORMATION COUNTY LOCATION	Lab. No.	Depth[1]	Total Solids	NH_4	Na	Ca	Mg	SiO_2	Fe Fil-tered	Fe Unfil-tered	Al_2O_3	Mn	SO_4	Cl	NO_3	CO_3	HCO_3	pH
PENNSYLVANIAN																		
BOND																		
22–5N–4W	B- 267	578–593	39218	16	13901	552	302	5.0	0.0	24	11	0.6	18	23274	5.7		53	
CHRISTIAN																		
10–13N–1E	906	176	44322	13	14765	1026	541	4.0	0.0	0.0	3.0	0.0	12	26157	18		44	7.5
CLARK																		
4–10N–14W	278	295–305	11626	4.6	4391	72	89	11	20	36	6.0	0.0	0	5450	9.9		2940	7.2
4–10N–14W	277	300–390	28376	9.3	10285	319	259	11	1.2	5.4	6.0	0.2	282	15947	11		1778	7.5
COLES																		
22–11N–10E	137	505–538	34001	5.4	12538	340	178	22	0.0		0.0	0.2	0	20192	9.6		459	
20–14N–10E	340	239–416	26640	8.2	9940	214	145	10	0.0	4.0	11	0.2	0	15632	6.2		881	7.9
CRAWFORD																		
15–5N–12W	56	985	15260	5.8	5673	5	53	32	6.0		5.0	0.0	1414	7096	5.3	360	608	
2–5N–13W	54	838	18782	10	7023	174	94	12	6.0		1.0		0	10372	7.1		1839	
2–5N–13W	55	898	18495		7086	59	87	32	0.6		16		0	10354			1603	
31–6N–11W	58	900	14011		4572	246	212	14	1.8		6.0		2390	6153			322	
31–6N–11W	57	900	14034	5.1	4505	340	220	46	1.6		9.0	0.4	2346	6200	3.5		458	
10–7N–13W	647	940–980	41306	11	14553	562	283	19	192		0.0	1.0	0	24106	1.2		291	6.5
EDGAR																		
3–13N–13W	725	422–457	52100	16	18078	951	454	18	0.0	1.2	16	0.5	581	30269	14	3	344	7.3
EDWARDS																		
13–3S–10E	441	1974–1983	54070	26	19643	648	431	13	0.4	2.8	19	0.8	57	32349			600	6.5
GALLATIN																		
15–8S–10E	488	1200	28194											15753				
4–9S–9E	849	1155–1164	37462	13	12671	895	286	4.0	0 0	50	12	0.4	850	21106	18		396	7.3
LAWRENCE																		
8–2N–12W	379	1508–1531	32920	257	11101	612	229	6.0	0.6	50	10	1.2	2258	17383	32		526	6.8
MACOUPIN																		
20–10N–7W	276	460–492	15958											9282				
MADISON																		
19–6N–6W	1017	540–549	23645															
20–6N–6W	1016	520–566	22547															
28–6N–6W	952	515–525	22432	8	7852	220	287	0.0	0.0		3.0	0.0	1461	12021	0.0	39	346	8.3
29–6N–6W	954	527–545	22998	8	7939	422	254	2.2	0.0	8.0	1.0	0.0	0	13632	0.0		193	7.9
MONTGOMERY																		
12–10N–5W	233	578–598	32880		12332	525	284	11	1.6	20	11	0.2	84	19718			422	
30–10N–4W	200	610–632	36190	19	13165	415	354	16	0.8	14	11	0.4	71	22030	15		17	
31–11N–5W	299	610–624	34486	18	12234	517	361	15	8.0	12	4.0	0.0	5	20449	9.9		699	6.8
WABASH																		
22–1N–12W	65	1442–1476	36367											20178				
17–1S–12W	258	2053–2072	55300	13	19204	1252	383	11	24	88	6.7	2.4	1458	31845	6.4	74		
WHITE																		
22–3S–10E	773	1958–1966	48886	18	17758	693	277	22	1.2	8.0	4.0	0.1	8	29238	18		320	7.1
6–4S–14W	453	1517–1556	28890	36	9540	951	245	7.0	4.0	30	7.3	1.6	1397	16048	5.3		164	6.4
27–4S–14W	484	733–747	14514															
DEGONIA																		
WHITE																		
19–4S–11E	436	1969–2020	54920	15	19630	958	440	21	0.4	7.0	7.4	0.4	419	32815	5.3		252	6.8
32–6S–9E	1102	1920–1934	65932															
PALESTINE																		
GALLATIN																		
4–8S–8E	486	1700	61288											36012				
33–7S–8E	240	1700–1722	59320		21036	765	790	11	0.8	2.0	11	0.0	43	35733		72	471	

HARDINSBURG																		
FRANKLIN																		
20–5S–3E	1063	2297–2312	126836															
29–5S–3E	1061	2308–2320	126162															
29–5S–3E	1062	2303–2320	125398															
HAMILTON																		
16–7S–6E	1127	2072–2081	72992															
WABASH																		
34–1N–13W	371	1779–1800	66420	23	22187	2174	705	5.0	10	30	16	1.2	3973	37102	0.0		215	6.6
WHITE																		
24–6S–10E	355	2000–2016	59896	51	21134	1231	500	10	0.0	0.0	16	0.0	690	35725	8.4	19	107	7.8
7–6S–11E	246	2012–2018	70430	9.3	24297	1773	601	8.0	2.4	11	26	0.8	1971	40788	4.2		217	
WALTERSBURG																		
EDWARDS																		
13–1N–10E	1035	2448–2466	99318															
31–1N–11E	309	2433–2437	95948	28	32222	2970	1022	9.0	96	144	55	4.8	1619	56734	50		30	5.2
31–1S–14W	1085	2284–2288	70940															
24–2S–10E	217	2375–2387	71840	18	24896	1728	640	14	0.2	6.4	24	0.6	55	43161	8.1		237	
6–2S–14W	1078	2254–2261	72080															
GALLATIN																		
20–7S–8E	878	2180–2188	81294	15	27839	2454	791	13	0.0	0.0	20	0.0	75	49471	18		118	7.4
21–7S–8E	742	2137–2157	83332	23	28307	2321	815	16	0.0	4.0	6.0	0.6	14	50060	11		150	6.9
22–8S–10E	744	1985–1994	64110	16	22655	1189	497	18	0.0	4.0	4.0	0.2	123	38276	3.5		211	7.2
WHITE																		
28–4S–14W	345	2102–2135	81798	23	29274	1222	708	6.0	7.0	100	9.0	0.0	48	49286	0.0		158	6.4
1–6S–9E	707	2291–2303	81320	28	28791	1336	710	20	1.0	4.0	16	0.8	0	48634	8.1		388	6.9
14–6S–9E	182	2261–2279	77990	98	27725	1341	739	13	2.3	11	8.7	0.2	159	47147	8.9		339	
16–7S–8E	565	2168–2197	81850	64	27573	2073	884	10	0.0	7.6	10	0.4	82	48661	18		293	
TAR SPRINGS																		
CLAY																		
16–3N–7E	785	2312–2320	127190	36	42806	3875	1221	14	0.0	3.0	3.0	1.2	217	76205	11		137	6.6
26–4N–7E	284	2316–2331	124956	34	42575	3876	1157	10	0.0	16	22	0.0	319	75587	26		183	6.6
EDWARDS																		
27–2S–14W	789	2226–2239	83308	23	27629	2652	740	22	2.0	2.4	13	1.0	2978	47107	11		282	6.7
FAYETTE																		
31–7N–3E	151	1275–1285	97600	42	33666	3802	12	9.0	0.0		14	0.0	88	58567	3.2	52	112	
22–8N–3E	216	1125–1202	103910	38	35674	3013	886	28	8.0	9.6	18	1.0	444	62577				
FRANKLIN																		
23–6S–2E	425	2086–2115	125200											72343				
24–6S–2E	247	2109–2143	118714	1.4	36512	5383	1727	10	19	48	36	1.8	29	70822	7.1		21	
25–6S–2E	383		116512											69904				
36–6S–2E	835	2107–2140	117600											71104				
12–7S–2E	241	2022–2080	117360	19	36175	6022	1602	17	1.6	8.0	36	4.0	73	71022	2.8		110	
35–7S–2E	325	2141–2151	105366															
GALLATIN																		
34–7S–10E	713	2121–2137	74740	15	26608	1128	503	18	0.0	3.2	10	0.2	0	44353	7.1		259	7.3
4–8S–8E	312	1884–1932	83780	4.1	28429	1743	1071	28	2.8	8.0	16	0.0	35	49644	9.9		638	6.9
13–8S–9E	1101		75092															
6–8S–10E	1106	2150–2160	78338															
15–8S–10E	287	2062–2080	70386	13	25696	830	479	9.0	0.4	2.4	11	0.0	21	42249	9.9	21	329	7.0
16–8S–10E	602	2060–2077	68300	26	24239	1087	476	21			15	0.8	3280	37687	3.5		1054	7.2
LAWRENCE																		
18–2N–12W	1009	1603–1612	41414															
WAYNE																		
17–2S–8E	865	2542	96860	34	32813	3239	864	0.0	0.0	10	26	3.2	1574	57620	27		193	7.2
WHITE																		
14–4S–14W	344	2230–2243	71612	20	24928	1584	677	5.0	1.0	10	51	0.0	10	43043	0.0		347	6.4
2–5S–9E	957	2553–2596	81908															
1–5S–10E	363	2288–2329	78500	21	27475	1610	751	11	0.0	0.6	9.0	0.4	3840	44329	4.0		411	6.8
28–6S–10E	541	2267–2290	89756	26	31240	1988	772	13	0.4	40	24	0.8	2600	51905	32		242	
7–7S–10E	623	2411	79954	72	26906	2197	601	8.0	8.0	18	21	0.8	768	46587	44		139	6.7
7–7S–11E	245	2109–2126	83418	11	30365	958	614	11	0.0	0.4	25	0.0	472	49663	4.2		536	

[1]Where sample was collected from more than one well, depths are not given.

FORMATION COUNTY LOCATION	Lab. No.	Depth	Total Solids	NH_4	Na	Ca	Mg	SiO_2	Fe Fil-tered	Fe Unfil-tered	Al_2O_3	Mn	SO_4	Cl	NO_3	CO_3	HCO_3	pH
WHITE																		
31–5S–9E	712	2622–2666	86432	16	28850	2361	794	14	4.0	6.4	9.0	0.8	0	50902	7.1		133	6.9
GOLCONDA																		
MONTGOMERY																		
19–7N–3W	1039	708–716	37674															
CYPRESS																		
CLAY																		
11–2N–5E	1197	2505–2535	126700															
11–2N–5E	1193	2538–2548	128380															
23–3N–5E	702	2575–2590	132638	46	44895	3476	1190	14	0.2	2.4	17		58	78789	4.9		160	6.5
13–3N–6E	654	2607	129320															
22–3N–7E	1204	2617–2628	102824															
23–3N–7E	776	2700–2750	105122	34	35714	2669	1150	30	2.0	16	12	0.4	148	69966	3.5		197	6.7
23–4N–7E	869	2598–2614	98434	26	33826	2403	1229	11	5.0	10	23	1.0	1081	59069	35		248	7.1
23–4N–7E	870	2600	99520															
11–4N–7E	650	2605–2625	103802	13	36160	2202	1084	23	12	2.0	40	0.4	0	62655	21		262	6.3
34–4N–8E	548	2695	97704	116	32967	2376	1454	18	0.4	4.0	7.4	1.2	374	58884	11		555	7.0
6–5N–7E	779	2491–2511	139792	39	45171	5485	1348	18	18	28	6.0	3.0	170	83171	11		67	6.0
13–5N–7E	582	2584–2591	105326											60757				
35–5N–7E	652	2945–2960	113226	28	38578	2806	1054	31	12	80	15	1.2	973	66736	5.3		141	5.9
CLINTON																		
16–1N–2W	248	1100–1110	65290	16	22133	1788	765	4.0	4.0	44	20	1.2	58	39482	8.9		32	
8–1N–3W	145	1032–1065	47488	26	16503	1088	546	11	0.0		7.0	0.4	31	28897	2.1		153	
18–1N–3W	603	925–976	42900	18	14840	875	511	7.0	20	55	9.0	0.8	91	25841	3.5		78	6.1
13–2N–1W	599	1417–1423	103934	34	33829	3635	1501	14	5.0	30	27	2.2	0	62988	2.5		70	5.9
27–2N–1W	606	1279–1288	94860	34	31519	3162	1290	8.0	0.6	5.0	15	2.4	20	57955	6.0		85	6.8
34–2N–1W	895	1260–1274	91492	21	29815	3027	1286	0.0	0.0	16	23	2.0	0	55052	9.0		71	6.9
10–2N–3W	161	1035–1068	53260	31	18089	842	1119	10	13		16	0.0	5	31733	6.4		1660	
COLES																		
2–11N–7E	758		118972	31	38298	4510	1186	7.0	0.0	12	9.0	1.0	1428	69313	8.0		281	6.7
10–12N–7E	1201		110342															
10–12N–7E	590	1766–1822	111522	18	35368	5525	1339	13	80	90	94	5.6	1691	66910	2.4		150	5.2
22–12N–7E	757	1758–1781	105684															
EDWARDS																		
19–1S–14W	667	2703–2722	103942	18	34137	4365	933	4.0	42	54	36	1.6	500	62791	3.5		61	6.2
34–2S–14W	204	2624	106170	23	35380	3995	1029	13	0.8	9.3	6.9	2.0	43	64579	5.0		85	
EFFINGHAM																		
24–6N–6E	848	2473–2483	136651	34	44691	4751	1400	5.0	23	15	52	2.8	67	81359	8.9		44	6.4
10–6N–7E	645	2534–2575	125736	28	40946	5034	1110	9.0	8.0	20	40	1.0	1170	74424	4.6		59	6.2
7–8N–4E	929	1552–1561	115572	21	38191	3976	1509	8.0	24	50	13	1.0	72	70288	0.0		12	5.1
18–8N–4E	928	1554–1589	116406	36	38160	3734	1676	12	0.0	40	10	2.0	287	70159	0.0		49	7.3
18–8N–4E	927	1579–1590	115614	26	37815	3881	1386	12	0.0	20	15	1.0	23	69201	0.0		44	7.8
FAYETTE																		
10–7N–3E	922	1564–1570	119470	18	39606	4022	1455	16	16	30	23	2.0	0	72527	0.0		41	7.0
10–7N–3E	923	1559–1598	120222	21	38578	4548	1432	7.0	0.0	20	20	1.0	125	71611	0.0		44	7.0
31–7N–3E	209	1574–1588	108940	32	36756	3513	1345	17	1.6	17	1.7	1.4	328	66593	4.2		63	
13–8N–3E	214	1458–1490	116430	35	39092	3824	1404	17	52	79	6.5	1.0	473	70828	1.4		39	
23–8N–3E	211	1459–1490	118166	30	39410	3844	1444	12	13	55	11	0.6	907	71137	1.4		46	
34–8N–3E	924	1539–1594	117350	21	38519	3888	1473	5.0	0.0	30	14	1.0	156	70307	0.0		61	7.3
35–8N–3E	925	1582–1612	117844	26	39131	3975	1523	2.0	0.0	10	8.0	1.0	81	71760	0.0		44	7.3
36–9N–3E	207	1531–1556	112730	32	37480	3938	1241	8.0	6.3	77	10	0.6	863	67781	8.9		29	
FRANKLIN																		
28–5S–3E	1014	2555–2559	143146															
4–6S–3E	1010	2572–2587	145689															
14–6S–4E	316	2832–2848	141672	0.0	47896	4145	1243	21	0.0	1.2	8.0	0.2	382	84431	5.0		156	7.0
16–7S–4E	749	2745–2757	138954	18	46471	4402	1292	13	68	260	16	2.0	7	83208	11		9	5.1

GALLATIN																		
21–7S–9E	1191	2620–2676	105516															
21–7S–9E	1226		104592															
26–8S–9E	1107	2466–2486	110716															
15–8S–10E	288	2423–2447	103934	17	36063	2258	866	13	0.0	5.6	15	0.2	3843	59093	7.8		387	6.8
HAMILTON																		
6–6S–7E	228	2714–2746	131460	57	44870	4493	1139	11	7.2	56	15	0.8	523	80097	2.1		139	
LAWRENCE																		
32–3N–11W	960	1568–1593	50202															
MARION																		
3–1N–1E	879	1657–1664	121858	41	39468	4237	1651	6.0	0.0	23	33	2.0	0	73262	2.0		107	7.1
3–1N–1E	880	1666–1671	121688	26	39626	4240	165	3.0	8.0	32	35	1.6	0	73429	2.0		7	4.8
3–1N–1E	881		121794															
3–1N–1E	884	1650–1663	121630	26	39541	4290	1680	10	0.0	8.0	28	2.0	0	73454	18		68	6.0
16–1N–1E	553	1661–1674	119058	39	38388	4367	1549	19	0.8	1.6	5.9	1.2	23	71429	21		53	7.1
18–2N–2E	598	1737–1762	112160	39	36298	4507	1506	15	4.0	23	21	2.0	214	68204	2.1		77	6.1
27–4N–1E	252	1346–1362	111950	2.6	36704	4209	1506	20	48	56	7.4	2.0	791	67844	5.7		10	
RANDOLPH																		
30–4S–7W	40	267	10561	3.1	3971	58	89	34	17			0.0	7	5128		12	2286	
RICHLAND																		
8–3N–9E	91	2930–2992	98182	1.3	32204	2483	1356	3.0			5.0		87	57514	6.0		709	
SALINE																		
36–7S–7E	1097	2518–2532	108296															
WABASH																		
4–1S–12W	438	1990–2065	80390	31	26968	2966	691	13	0.4	4.0	4.4	0.8	808	48241	1.8		112	6.2
18–1S–12W	259	2082–2100	80000	22	27110	2243	809	11	48	96	9.4	1.4	177	47977	11		96	
29–1S–13W	732	2549–2570	96430	26	31748	3570	836	13	2.0	27	10	2.4	186	57516	11		83	6.3
24–1S–14W	741	2562–2566	97074	23	32091	3386	928	13	1.2	20	8.0	2.4	5	58120	11		109	6.6
9–2S–13W	205	2416–2433	93800	44	31565	2788	1183	18	28	99	24	1.8	449	56781	2.1		39	
30–2S–13W	219	2467–2492	105780	25	34128	4839	1030	15	5.6	9.6	17	4.0	1057	63332	7.1		207	
2–2S–14W	729	2560–2570	104590	16	31456	6661	836	16	0.9	16	10	2.0	1743	61386	11		89	5.7
WASHINGTON																		
25–1S–1W	887	1562–1570	114896															
WAYNE																		
20–2S–8E	876	2967–2974	122300	18	41748	3163	1060	4.0	0.0	20	19	0.0	235	72851	9.0		114	6.8
WHITE																		
25–4S–9E	731	2863–2880	113640	21	35219	6043	1148	13	34	85	0.0	2.4	839	67654	8.9		174	5.8
34–4S–14W	338	2575–2597	106645	26	34795	4500	980	17	7.0	35	37	3.2	4	64498	3.5		40	
18–5S–9E	556	2848–2866	111812	77	34981	5461	933	31	200	420	6.0	4.0	1761	65129	28		38	7.0
10–5S–9E	1222	2948–2966	116070															
22–5S–9E	133	2863–2888	114304	23	37532	4576	618	22	0.0		267	0.0	72	67688	5.3		105	
2–7S–8E	563	2662–2697	104614	39	33454	4484	832	25	8.0	60	4.0	1.6	50	61906	50		78	
"BENOIST"-BETHEL-PAINT CREEK																		
BOND																		
24–4N–2W	110	1328–1380	66389	18	23031	1666	983	3.0	0.2		7.0	0.4	327	40971	43		217	
31–4N–2W	328	1105–1127	53420	36	18304	962	691	15	0.0	4.0	5.0	0.8	51	31850	11		198	7.4
24–4N–3W	855	1114–1123	49522	16	18346	762	636	8.0	15		19	0.2	0	29539	3.5		344	
10–6N–2W	227	1003–1021	55490	31	19797	972	658	16	0.4	6.4	6.4	0.6	644	33654	2.1		159	
CHRISTIAN																		
9–13N–1E	905	1060–1080	94124	36	31542	2743	1247	1.0	0.0	8.0	8.0	1.0	19	57114	18		112	7.4
10–13N–1E	899	1065–1075	92602															
10–13N–1E	901	1063–1082	90444															
CLAY																		
3–3N–5E	1001	2688–2697	136140															
23–3N–5E	701	2711–2721	139964	36	46042	4973	1356	20	16	24	11	1.2	689	83254	8.0		66	5.8
17–3N–6E	642	2749–2757	133032	57	43786	4616	1127	9.0	1.0	4.0	23	1.0	0	79003	11		85	6.3
17–3N–6E	932	2746–2758	127834	52	42285	4470	1180	7.0	24	36	34	2.0	28	76615	0.0		54	6.1
30–3N–6E	314	2659–2715	128270	0.0	43175	3437	1155	23	2.4	16	5.6	0.6	693	75459	6.7		77	6.5
14–4N–5E	1042	2463–2475	134560															
14–4N–5E	1045	2473–2481	134024															
27–4N–5E	1000	2596–2601	133750															
34–4N–5E	999	2589–2609	135712															
35–4N–5E	1003	2595–2625	131956															

FORMATION COUNTY LOCATION	Lab. No.	Depth	Total Solids	NH_4	Na	Ca	Mg	SiO_2	Fe Filtered	Fe Unfiltered	Al_2O_3	Mn	SO_4	Cl	NO_3	CO_3	HCO_3	pH
CLINTON																		
14-1N-1W	300	1430-1440	95488	43	32058	2932	1191	9.0	0.8	16	20	0.0	28	58084	16		98	6.5
2-1N-2W	191	1324-1329	70680	39	24250	1796	920	13	2.3	12	4.7	0.2	54	43196	6.4		154	
2-2N-2W	323	1226-1234	71932	14	23730	1794	913	8.0	0.0	16	6.0	0.4	77	42320	5.3		126	6.8
5-3N-2W	854	1143-1152	57498	21	19315	1289	768	0.0	0.0		10	1.0	0	34017	4.0		537	6.8
7-3N-2W	607	1138-1146	54920	26	18837	865	911	14		13	10			32686	18		1005	7.2
7-3N-2W	856	1132-1142	53864	28	18599	827	860	9.0	0.0		22	0.0	0	32313	11		664	
7-3N-2W	857	1141-1145	55354	16	18828	949	905	5.0	0.0		16	0.0	0	32963	11		699	
12-3N-3W	1029	1107-1115	47912															
12-3N-3W	1030	1106-1110	47638															
14-3N-3W	1027		46482															
14-3N-3W	1028	1114-1118	47660															
23-3N-3W	1026		46758															
23-3N-3W	1033		48258															
26-3N-3W	1031	1144-1163	47478															
EDWARDS																		
8-1N-14W	724	2800-2830	112512	26	34276	5648	1197	19	4.0	8.0	58	0.8	837	65724	12		98	5.7
5-2S-14W	518	2840-2860	100534	15	17819	4940	1032	15	0.0	1.0	12	0.8	1178	65381	3.5		190	
EFFINGHAM																		
9-6N-5E	1200		12930															
10-6N-5E	1199	2296-2306	129884															
FAYETTE																		
10-4N-1W	1049		92546															
30-5N-3E	298	1898-1909	117264	46	40489	3021	1162	9.0	0.0	1.6	17	0.0	68	71111	14		143	6.6
22-5N-4E	695	2327-2347	122736	62	40403	4284	1408	7.0	48	70	0.0	1.0	2	74077	7.4		38	5.7
6-7N-3E	212	1509-1524	110460	32	37243	3672	1375	10	4.0	9.5	5.3	0.4	35	67930	1.4		63	
9-7N-3E	208	1554-1568	110030	45	37334	3477	1323	12	10	24	3.3	0.6	182	67488	2.8		63	
29-8N-3E	213	1458-1542	112170	41	37526	3554	1437	23	1.6	28	7.7	0.6	66	68320	2.1		83	
29-8N-3E	131	1442-1487	110634															
29-8N-3E	132	1583-1605	108656		36598	3483	1229	8.0	1.0		21	0.0	95	66020		104	0	
30-8N-3E	206	1562-1569	106724	93	35747	3523	1278	11	13	44	8.0	0.6	159	65102	9.2		56	
HAMILTON																		
27-5S-6E	244	2940-2959	134670	77	45836	4295	1240	16	4.0	32	30	1.0	1134	81144	8.1		96	
34-5S-6E	226	2997-3011	135080	46	46460	4191	1246	31	6.4	48	13	1.2	472	82373	2.1		88	
JACKSON																		
22-7S-1W	348	2000-2028	114222	36	36905	4344	1572	9.0	6.0	14	40	0.0	966	68506	0.0		45	
JEFFERSON																		
9-1S-1E	147	2035-2084	119752	31	39102	4456	1496	11	0.4		20	1.0	1	72584	2.8		56	
3-1S-2E	99	1951-1970	123665											73916				
9-1S-2E	483	1941-1959	123386															
10-1S-2E	97	1963-1983	121660											71235				
10-1S-2E	98	1960-1990	123629											73811				
19-1S-2E	525	2039-2051	125962	77	39903	5075	1771	12	0.4	0.6	35	0.6	13	75773	14		51	
2-2S-1E	764	1945-1960	124870	52	39757	4871	1617	12	10	12	8.0	1.2	802	74067	3.5		103	6.4
24-2S-1E	689	2029-2038	124934	39	39452	5344	1465	17	14	20	18	1.2	0	74438	5.3		78	6.3
25-2S-1E	255	1977-1990	123816	1.6	39663	5174	1523	7.0	4.0	20	16	1.0	60	74686	5.7		31	
35-2S-1E	264	1878-1991	124400	36	39536	5216	1576	4.0	16	48	10	0.2	8	74836	5.0		16	
2-3S-2E	934	2521-2620	130810	26	41173	5520	1765	6.0	8.0	24	24	1.0	23	78389	0.0		46	6.1
32-3S-2E	374	2466-2490	138240	41	45026	5384	1445	9.0	10	28	15	0.0	449	82878	0.0		60	5.8
32-3S-2E	716	2457-2471	138672	77	44730	5440	1363	15	2.0	16	5.0	1.2	45	82329	11		60	6.0
LAWRENCE																		
22-2N-11W	375	1744-1772	56390	25	19579	1418	552	17	0.4	10	7.4	0.2	770	33717	0.0		124	7.1
MARION																		
21-1N-2E	644	1919-1928	125418	39	39727	5029	1572	6.0	4.5	12	41	1.4	0	74799	6.4		24	5.8
18-3N-1E	171	1422-1439	92112	44	31360	2577	1171	11	1.4		20	0.2	10	56330	15		120	
34-3N-2E	691	1927-1939	126560	43	40255	4773	1486	18	12	16	10	1.0	0	74885	5.3		58	6.1

21-4N-1E	78	1376–1418	103906	1.0	34570	3513	1127	120	225		240	4.0	198	62610	8.0		125	
28-4N-1E	117	1392–1423	102435	33	33921	3050	1297	3.0	1.8		49	1.4	187	61320	1.4		156	
35-4N-2E	532	1959–1974	125598											75042				
35-4N-2E	533	1959–1974	124790											74608				
36-4N-2E	301	1932–1939	122838	41	40315	4467	1448	13	8.0	24	10	1.0	8	74333	20		28	5.5
19-4N-3E	996	1910–1917	125754															
16-4N-4E	639	2142–2149	129218	33	40625	4976	1514	14	3.6	20	33	3.7	206	75750	10		50	6.2
MONTGOMERY																		
23-7N-4W	1038	790–798	40168															
SHELBY																		
17-10N-4E	596	1769–1788	113700	44	37092	4026	1533	8.0	6.0	25	48	0.0	0	68855	1.8		18	5.2
WABASH																		
4-1N-13W	538	2525–2552	92584	39	30137	3974	970	5.0	15	40	30	2.0	709	55756	7.0		205	7.1
16-1S-12W	253	2125	65116	9.3	21704	2101	709	30	0.0		16	1.0	124	39101	5.3		123	
8-1S-13W	661	2550–2578	98150	21	32194	3897	985	21	7.2	13	17	1.0	978	58505	3.0		70	6.3
16-1S-13W	665	2585–2608	96038	18	31630	3927	850	13	52	70	26	2.8	1470	57105	3.2		92	6.2
17-1S-13W	666	2606–2675	102740	18	38252	4320	955	8.0	8.0	12	16	0.6	1217	61531	28		149	6.7
17-1S-13W	736	2575–2598	100626	28	32315	3955	932	11	0.0	10	12	1.3	980	58798	8.9		122	6.8
WASHINGTON																		
23-1S-1W	229	1541–1550	105400	59	35532	3536	1372	12	8.8	40	16	1.2	41	65089	2.1		67	
33-2S-2W	1217	1430–1434	87370															
34-2S-2W	1218	1430–1433	88588															
19-3S-1W	195	1349–1370	98760	52	32478	3087	1192	9.0	4.4	11	31	0.8	26	59046	5.0		85	
22-3S-3W	143	1268–1293	60480	29	20817	1553	783	4.0	0.0		28	0.6	395	36821	3.7		119	
29-3S-4W	235	1007–1034	36350		12601	665	436	9.0	0.8	26	11	0.2	1693	20530			165	
WAYNE																		
26-2S-9E	1099	3119–3133	116734															
WHITE																		
11-4S-10E	992	2906–2925	111500	18	35421	5151	1030	0.0	24	32	46	1.0	927	66048	9.0			5.3
18-4S-14W	440	2795–2853	108400	31	35847	4502	1059	13	30	40	87	4.0	1523	65197	0.0		114	5.3
28-4S-14W	337	2680–2725	110876	31	36299	4691	1040	16	7.0	7.0	28	0.8	968	66495	6.2		264	
25-5S-10E	367	2824–2838	116502	46	39446	3432	1110	0.0	6.0	20	12	0.0	132	70014	2.5		183	
18-6S-9E	877	2795–2815	107498	41	35889	3396	1163	0.0	0.0	0.0	30	1.0	437	64417	9.0		98	7.3
32-6S-9E	1103	2876–2899	113940															
2-7S-8E	566	2789–2804	107736	52	34570	4452	836	27	3.4	30	4.0	0.4	418	63309	43		104	
LOWER RENAULT																		
GALLATIN																		
32-8S-10E	743	2734–2759	127562	39	43245	3980	898	13	8.0	32	21	1.4	2877	74251	11		46	6.1
AUX VASES																		
CLAY																		
4-2N-5E	311	2770–2806	140576	103	45312	5756	1533	4.0	8.0	24	22	0.6	1110	83832	64		62	5.7
8-2N-7E	674	2974–2986	136040	35	45217	4813	1220	12	48	80	3.0	1.2	711	81467	11		26	6.0
17-5N-5E	156	2356–2366	116074	52	37896	4685	1453	10	16		19	0.6	412	70691	5.7		103	
20-5N-7E	366	2734–2782	126124	51	42953	4040	1073	3.0	20	40	15	0.0	901	75884	1.1		92	
26-5N-7E	811	2807–2818	136666															
35-5N-7E	653	2806–2823	140344	52	46670	5060	1308	8.0	1.0	16	14	0.4	1156	83900	9.6		69	6.0
COLES																		
25-12N-7E	437	2012–2024	117340	36	38979	4416	1195	12	6.0	40	26	0.4	1945	69968	1.8		112	5.7
2-13N-7E	283	1822–1842	117302	49	38271	3578	1942	15	0.0	0.0	24	0.0	629	70376	25		422	7.0
EDWARDS																		
18-1N-10E	372	3132–3172	125280	41	40576	6005	1130	0.0	0.0	14	11	0.0	1909	75107	5.3		78	5.9
30-1S-11E	370	3050–3261	119240	41	36894	5805	1942	8.0	12	30	28	0.0	2035	71355	2.7		63	6.1
6-2S-11E	872	2994–3017	111762															
2-3S-10E	522	3144–3170	102804	51	32526	4870	1197	7.0	10	10	41	0.6	1775	60976	7.1		123	
FRANKLIN																		
26-5S-1E	720	2640–2700	138646	36	42830	6641	1443	8.0	0.0	4.0	2.0	0.4	502	81598	11	17	70	7.9
19-5S-3E	1058	2734–2754	136940															
11-6S-2E	297	2717–2726	140062	39	45861	5201	1672	9.0	1.6	16	59	0.4	579	84406	11		47	5.8
26-6S-4E	531	3110–3132	132684	5.2	39536	5875	1768	9.0	40	40	4.8	0.8	802	75882	28		48	7.0
36-6S-4E	529	3105–3156	137310	103	42723	6741	1929	7.0	0.0	1.0	2.0	0.2	792	83019	21		53	7.0
10-7S-4E	715	3100–3115	139248	29	42298	6510	1645	14	44	95	13	1.2	631	81073	7.1		43	5.4
12-7S-4E	971		136130															
14-7S-4E	555	3113–3147	136754	52	41873	6585	1772	16	6.0	80	19	1.0	391	81156	18		34	7.0

FORMATION COUNTY LOCATION	Lab. No.	Depth	Total Solids	NH_4	Na	Ca	Mg	SiO_2	Fe Filtered	Fe Unfiltered	Al_2O_3	Mn	SO_4	Cl	NO_3	CO_3	HCO_3	pH
GALLATIN																		
21–7S–8E	564	2905–2962	128920	52	39327	6766	1241	9.0	4.0	50	4.0	0.0	1465	75156	18		121	6.1
27–8S–9E	1096		133730															
HAMILTON																		
14–4S–7E	770		157356															
14–4S–7E	782	3264–3286	160712	77	50418	7135	1744	19	9.0	40	17	0.8	1149	94626	18		109	5.5
16–4S–7E	961		145634															
15–5S–7E	527	3355–3365	136258	39	43864	6266	1458	7.0	20	50	12	0.2	1089	82194	8.9		73	6.9
11–6S–5E	994	3196–3232	138096															
22–6S–5E	434	3145–3185	134290	90	42766	6635	1662	8.0	10	12	16	1.2	1034	81887	16		73	5.7
22–6S–5E	1126	3192–3215	132630															
22–6S–5E	1129	3178–3212	132922															
29–6S–5E	1128	3280–3309	134158															
33–6S–5E	997	3222–3286	128490															
34–6S–5E	947	3316–3340	130396	26	39880	6254	1802	11	20	20	10	0.0	850	77189	18		49	5.7
2–6S–6E	1189		136206															
2–6S–6E	1190	3044–3050	135506															
3–6S–6E	428	3029–3055	138730	41	46733	4548	1368	9.0	1.0	10	16	0.0	908	83467	3.5		59	6.1
13–6S–6E	431	3092–3110	137990	38	43297	5958	1603	10	16	20	17	0.0	682	81509	1.8		64	5.9
26–6S–6E	307	3057–3074	135666	98	41199	5033	2800	52	0.0	4.0	3.0	0.0	550	80281	16		153	6.7
6–7S–5E	970	3200–3234	135084															
3–7S–5E	1123	3176–3188	133814															
4–7S–6E	1119	3176–3200	133196															
4–7S–6E	1121	3185–3197	132948															
JEFFERSON																		
19–1S–2E	557	2118–2158	123312		40227	4362	1627	15	0.0	3.5	8.0	1.0	112	74390			24	
15–1S–4E	1133	2726–2734	141192															
17–1S–4E	696	2678	136104	31	43869	5584	1373	8.0	8.0	40	9.0	0.4	322	81288	5.3		48	6.1
22–1S–4E	1131	2705–2709	141710															
13–2S–4E	550	2938–2956	140814	103	45611	4966	1652	12	12	20	14	0.4	1161	83245			29	7.0
1–3S–1E	766		124774	39	39503	4858	1566	13	10	12	9.0	1.2	0	74085	3.5		85	6.4
2–3S–2E	806	2586–2597	132058	103	40414	5119	1800	19	2.4	104	20	1.8	3	76716	25		0	3.8
2–3S–2E	933	2595–2603	132128	15	40410	5785	1785	6.0	24	103	22	3.0	0	77729	0.0		49	6.0
3–3S–2E	868	2579	131328	36	41322	5065	1888	10	10	25	36	1.0	0	78207	11		34	6.7
18–3S–3E	445	2665–2693	143400	31	46780	5280	1532	13	6.0	6.0	22	0.8	525	85585	0.0		42	5.7
18–3S–3E	718	2665–2693	141478	31	45006	5480	1462	11	8.0	16	1.0	1.0	490	82983	12		56	6.0
21–3S–3E	326	2735–2762	143576	36	47055	4736	1413	16	12	40	25	2.0	231	84914	7.1		59	6.2
MARION																		
21–4N–4E	637	2200–2212	130672	45	41032	5006	1522	26	7.0	8.0	24	3.7	292	76393	39		54	6.0
SALINE																		
24–7S–7E	1018	2934–2951	109158															
8–8S–7E	289	2880–2898	91802	41	29208	4339	860	5.0	32	64	16	0.0	2040	53759	11		53	5.3
SHELBY																		
12–10N–2E	251	1725–1735	102692	2.1	35032	2763	1127	14	0.0	8.0	27	0.4	55	62076	4.2		127	
27–10N–5E	173	1940–1969	110930	39	37110	3539	1400	14	11	18	8.9	0.6	0	67569	9.6		112	
14–11N–4E	662	1856–1906	120624	28	39683	4497	1344	7.0	0.0	7.2	18	0.8	45	73033	3.9		55	5.9
21–11N–4E	595	1830–1855	112500	31	36846	4010	1210	9.0	14	20	41	2.0	8	67476	1.1		27	5.4
WAYNE																		
18–1S–5E	327	2907–2910	140640	49	47530	4803	1262	14	8.0	24	12	0.2	672	85038	3.9		38	6.2
26–1S–5E	549	2980–3013	144816	39	47832	5296	1284	13	7.0	20	12	0.8	998	86177	21		35	7.0
29–1S–5E	1195		144114															
14–1S–6E	361	3050–3088	143876	36	46285	6578	1581	8.0	4.4	20	36	0.0	1203	86747	5.8		74	6.1
25–1S–6E	332	3115–3133	141444	39	45649	6685	1047	8.0	1.0	10	8.6	1.4	1364	84274	1.4		111	6.4
29–1S–6E	1167	3030–3044	143562															
8–1S–7E	342	3130–3163	145310	51	46304	6215	1518	4.0	2.8	4.0	26	0.0	1542	85742	9.3		60	6.9
16–1S–8E	1211		136440															
17–1S–8E	975	3098–3129	135474															
31–1S–8E	1037	3243–3254	143078															
16–2S–8E	783	3240–3270	148348	103	47066	6234	1661	24	12	28	18	0.5	1308	87672	18		68	5.8
17–2S–8E	451	3226–3250	152740	51	48105	6925	2426	15	0.8	8.0	12	0.2	1685	92319	3.5		56	6.2

28-2S-8E	772	3332-3349	140250	49	45607	5575	1192	19	10	20	8.0		1435	82621	18		115	6.2
5-2S-9E	984	3226-3254	132268															
20-2S-9E	1221	3280-3320	133004															
32-2S-9E	988	3210-32:0	125892															
7-3S-8E	685	3253-3260	148182	43	47172	6404	1407	11	20	24	13	0.5	798	87578	50		82	6.7
4-3S-9E	979	3278-3311	122640															
WHITE																		
21-3S-9E	977	3247-3287	127660															
30-3S-9E	243	3370-3385	128000	28	40411	6578	109	18	0.4	128	28	1.4	1923	75696	5.0		110	
8-4S-10E	958	3079-3085	133586															
23-4S-14W	336	2832-2882	125243	36	39764	6006	1531	33	10	14	27	0.4	1426	75395	3.5		52	
3-5S-9E	310	3222-3240	126180	31	39611	6239	1310	10	3.2	24	21	0.2	1320	74911	142		57	5.8
18-5S-9E	891	3145-3149	124524															
21-5S-9E	688	3180-3209	127318	45	40213	5746	1300	10	0.2	3.0	21	0.5	681	75425	64		86	7.0
11-5S-10E	1188	2981-2991	122212															
33-5S-10E	622	3002-3027	116876	52	37783	5067	1049	8.0	7.0	12	9.0	0.1	989	69603	31		58	6.3
24-6S-10E	356	2840-2887	118338	31	40577	3515	1058	12	0.4	2.8	14	0.8	2992	69666	3.5		101	6.7
33-6S-10E	357	2900-2914	122974	31	41871	3914	1088	8.0	3.2	10	23	0.0	238	72912	9.3		84	6.1
13-7S-9E	714	2923-2961	124120	103	40841	3835	1085	8.0	0.0	0.0	7.0	0.4	719	72431	35		156	7.8
4-7S-10E	740	2890-2913	122614	69	41255	3898	1073	13	0.0	0.4	4.0	0.6	2723	71683	3.5		104	7.4
WILLIAMSON																		
7-9S-3E	950	2385-2400	129624	31	39029	6055	1798	10	0.0	0.0	49	1.0	1177	75231	0.0		139	7.0
STE. GENEVIEVE																		
CHRISTIAN																		
3-13N-1E	903	1179-1183	88134															
4-13N-1E	904	1186-1194	87870															
10-13N-1E	907	1184-1191	91264	26	30349	2741	122	7.0	0.0	0.0	5.0	1.0	65	55461	18		129	7.4
CLAY																		
4-2N-6E	635	2990-3010	147880	36	47661	5564	1402	12	0.0	5.0	52	0.0	1701	86162	6.7		44	6.6
3-2N-7E	809	3074-3117	145292	206	44276	5102	2824	10	0.0	4.3	6.0	1.8	570	85428	14		78	6.7
8-2N-7E	672	3075-3087	147590	49	48160	6430	113	22	0.0	0.0	7.0	0.8	36	89630	21	18	59	7.8
12-2N-7E	836	3059-3085	144082															
17-2N-7E	704	3107-3116	143574	36	45809	6353	1479	43	120	200	21	1.6	775	85555	6.4		146	5.7
7-3N-6E	1183	2894-2897	136740															
13-3N-6E	657	2957-2985	146370											86568				
23-3N-6E	655	2982-3012	147240	52	47080	5571	1826	20	0.4	1.2	5.0	0.0	2083	86276	11		87	6.4
9-3N-7E	784	2959-2971	144330	77	46977	5977	1325	18	0.0	0.0	5.0	0.4	273	86490	11	47	467	7.7
16-3N-7E	795		143030											86451				
20-3N-7E	787	2973-2985	142798	206	46517	5580	1249	17	0.0	0.2	5.0	0.2	194	84940	50		858	7.7
20-3N-7E	1168	2978-2985	142626															
24-3N-7E	862	3005-3036	141914	62	41694	8909	1729	0.0	36	65	28	1.4	1595	83801	13		393	5.5
25-3N-7E	1166	3046-3065	147424															
33-3N-7E	837	2978-3050	148204															
8-3N-8E	830	3018-3024	153342	64	46079	6441	210	26	0.0	10	26	0.0	1837	87242	25		94	6.7
11-4N-5E	700	2581-2703	128430	62	40605	4782	1701	27	0.0	5.6	16		745	76821	8.0		63	6.6
11-4N-5E	1043	2568-2579	128310															
14-4N-5E	1046	2617-2629	132412															
5-4N-6E	863	2732-2743	137352	62	44480	5367	1521	3.0	0.0	15	10	0.0	0	82563	8.9		66	6.8
5-4N-6E	864	2725-2759	135610															
2-4N-7E	1173	2885-2996	140012															
15-4N-7E	814	2958-2996	139070															
2-4N-8E	1002	3006-3022	142988															
4-4N-8E	1112	2976-2993	142656	57	43976	5540	1794	15	0.0	2.0	13	0.0	2121	81239	11		115	6.7
31-4N-8E	807	3013-3051	150258	16	45301	6015	1968	3.0	1.0	12	13	0.0	1844	84988	9.0		13	5.3
3-5N-5E	938	2444-2486	115906	52	34918	6306	1755	16	0.0	0.0	0.0	2.0	300	69903	0.0		137	6.8
13-5N-5E	936	2452-2460	114450	77	38380	2664	1938	29	0.0	16	6.0	0.0	508	69246	0.0		107	7.6
14-5N-6E	1034	2810-2850	136392															
14-5N-6E	1036	2798-2804	137318															
24-5N-6E	780	2817-2827	146008	103	46220	5261	1711	22	1.4	12	9.0	0.1	1508	84577	1.0		57	6.7
26-5N-6E	1220	2802-2841	139160															
5-5N-7E	1149	2809-2845	141956															
8-5N-7E	330	2800-2830	137350	55	45541	4306	1557	17	0.2	2.4	5.7	0.6	613	81932	13		162	7.9
14-5N-7E	818	2852-2871	143394															
35-5N-7E	1171	2918-2950	143408															

FORMATION COUNTY LOCATION	Lab. No.	Depth	Total Solids	NH_4	Na	Ca	Mg	SiO_2	Fe Filtered	Fe Unfiltered	Al_2O_3	Mn	SO_4	Cl	NO_3	CO_3	HCO_3	pH
CLINTON																		
34–3N–3W	128	1104–1212	47333											27799				
COLES																		
15–11N–7E	593	1954–2032	112080	31	35552	5032	1545	6.0	23	45	64	0.8	1087	67365	5.3		205	5.6
2–12N–7E	589	1930–1957	109360	26	36322	3529	1568	28	0.0	2.8	131	0.2	56	66739	5.0		146	6.9
22–12N–7E	698	1928–2010	122452	93	38141	4856	1626	14	0.0	4.0	3.0	0.0	904	71527	8.7		180	7.0
25–12N–7E	437	2012–2026	117340	36	38979	4416	1195	12	6.0	40	26	0.4	1945	69968	1.8		112	5.7
CUMBERLAND																		
31–9N–7E	723	2446–2454	117332	52	37506	3897	1737	19	0.0	1.6	17	0.3	338	69510	35		136	6.7
36–9N–9E	586	2640–2662	127468	36	40889	5363	1505	21	40	50	77	1.6	2100	75421	8.9		140	5.4
36–9N–9E	826	2648–2662	128142															
EDGAR																		
1–12N–11W	914	1000–1011	27902															
2–12N–11W	913	975–998	24626	5.0	8738	455	272	22	0.0	0.0	7.0	0.0	724	14342	18		336	7.9
EDWARDS																		
1–1N–10E	964	3201–3205	123388															
8–1N–10E	793	3274–3282	133254	52	39585	5625	2719	37	0.0	4.0	8.0	0.0	1644	77238	11	46	870	7.9
12–1N–10E	537	3218–3229	120162	90	36788	5041	2005	5.0	0.0	0.0	49	0.0	2287	69871	25	62		7.1
7–1N–11E	851	3205–3215	116784															
18–1S–14W	663	3056–3065	119196	34	36836	5515	2030	11	0.0	2.6	16	0.0	2057	70836	5.3	50	260	7.8
31–1S–14W	874	3113–3123	120388	36	36686	6220	2079	3.0	5.0	10	28	0.0	1652	72400	9.0		120	6.7
19–2S–10E	250	3338–3351	127790	2.1	37859	6508	2559	16	0.0	0.0	21	0.0	1628	76111	3.2		70	
27–2S–14W	543	2976–2998	125960	52	37658	6336	2140	18	0.0	0.0	49	0.4	1814	74191	32	16	117	
28–2S–14W	822	3066–3080	126274															
31–2S–14W	821	3126–3190	127770															
EFFINGHAM																		
22–6N–5E	308	2490–2508	126378	59	37359	7130	2222	10	64	64	19	1.2	109	76715	18		15	5.3
33–6N–5E	1182	2488–2492	116674															
16–6N–6E	524	2556–2573	139924	141	46219	4755	1888	27	0.0	0.2	41	0.0	423	85045	52		131	
20–6N–7E	1084		133084															
28–6N–7E	1083	2861–2869	134970															
31–6N–7E	1142	2844–2962	137020															
32–6N–7E	1148	2853–2861	139098															
8–7N–7E	722	2649–2661	133884	36	43193	4807	1381	18	0.2	2.0	19	0.3	886	78416	21		168	6.4
8–7N–7E	845	2652–2663	132584															
FRANKLIN																		
21–5S–3E	1013	2911–2945	136558															
24–6S–1E	1065	2675–2685	135890															
13–5S–4E	705	3324–3330	143862	49	43409	6451	2201	22	0.0	2.8	14	0.5	497	84495	8.8		36	6.5
7–6S–2E	365	2710–2725	141934	77	45219	5165	1955	3.0	10	30	20	0.0	287	84465	2.5		54	
13–6S–3E	429	2890–3020	139400	41	41380	6716	2298	17	0.6	10	8.1	0.0	675	81852	7.1		191	6.2
21–6S–4E	748	3050–3094	141294	31	45686	4961	1329	21	0.4	12	6.0	1.0	919	82403	12		99	6.3
25–7S–2E	452	2756–2790	129050	46	40312	5645	2015	11	0.0	0.0	7.0	0.0	622	77606	0.0		79	6.8
35–7S–4E	234	3108–3114	137240		38721	9845	2149	23	400	440	11	2.0	580	82599			620	
GALLATIN																		
8–8S–8E	1178	2867–2868	128752															
2–8S–9E	625	2716–3020	132612	82	42313	6115	1168	6.0	0.2	3.2	36	0.2	2598	77609	15		158	6.7
2–8S–9E	631	2716–3020	134660															
25–8S–9E	176	2785–3007	129064	27	43065	4574	1293	7.0	12	21	8.5	0.2	2741	76218	8.1		121	
HAMILTON																		
34–3S–5E	239	3335–3359	145804		42784	9425	2346	15	32	40	10	0.6	1543	88283			110	
29–3S–7E	941	3402–3417	148982	31	43920	7439	2448	18	0.0	0.0	22	0.0	1558	86893	0.0		61	6.2
30–3S–7E	998	3398–3411	147676															
3–4S–6E	943	3440–3530	150286	31	45489	6494	2179	19	0.0	16	25	0.0	1365	86994	9.0		46	7.1
18–4S–7E	1056	3432–3475	149802															
18–4S–7E	1122	3397–3428	150246															
20–4S–7E	890	3422–3484	144372															
26–4S–7E	221	3429–3513	136820	57	42339	6753	2230	29	32	64	35	1.0	1953	82378	4.3		44	
35–5S–5E	942	3324–3330	140040	31	42145	6593	2387	4.0	0.0	16	2.0	0.0	556	83195	9.0		78	7.3
23–5S–6E	432	3200–3222	143090	46	45336	6141	2150	13	0.6	5.0	10	0.0	791	86513	3.5		43	6.2
10–5S–7E	752	3519–3524	134794	49	41741	5769	2222	13	0.0	0.0	6.0	0.0	1432	80023		46		8.4

13-6S-5E	435	3250-3260	138040	36	41103	6924	2505	7.0	0.4	3.0	9.4	0.0	742	82408	12		60	6.5
34-6S-5E	945	3353-3442	141066															
35-6S-5E	946	3346-3350	143042	62	44544	5360	2860	18	0.0	0.0	37	0.0	240	86349	35		110	7.2
11-6S-6E	1238	3150-3223	155976															
17-6S-6E	944	3212-3220	151996	88	48293	5692	1937	19	0.0	0.0	34	0.0	1873	88930	27		34	6.1
27-6S-7E	1179	3277-3288	134708															
7-7S-5E	968	3200-3210	140082															
JASPER																		
3-5N-9E	545	3048-3065	132180	39	41591	6529	1215	17	12	70	129	1.6	1970	77815	14		10	
33-6N-9E	791	3098-3160	134860	90	40960	7385	1690	17	16	54	13	1.0	1637	80059	11		81	6.1
16-6N-10E	274	2788-2820	126428	41	39911	5563	1670	6.0	0.4	16	13	0.0	2156	74693	20		69	·
27-6N-14W	948	2682-2690	111182	26	33801	5034	1922	28	0.0	16	29	0.0	2060	65069	9.0		198	7.1
31-7N-10E	587	2853-2863	130204	52	42061	5606	1677	23	0.4	15	39	0.2	2072	78155	3.5		145	6.4
34-7N-10E	588	2648-2745	123972	52	39743	5106	1705	30	11	23	104	1.2	2100	73798	5.0		60	5.5
18-7N-11E	680	2425-2469	106134	20	33259	3880	1367	3.0	0.2	6.0	12	0.0	829	61395	5.0		38	5.9
JEFFERSON																		
5-1S-3E	320	2617-2627	129364	0.4	41014	4953	2013	22	0.0	0.1	14	0.2	384	77518	6.4		115	7.5
13-1S-3E	554	2728-2835	134640	26	42372	6134	1506	25	3.0	12	9.7	1.0	485	80193	46		67	7.0
13-1S-3E	1154	2751-2854	134090															
28-1S-3E	1011	2618-2629	132243															
17-1S-4E	1150	2734-2821	136346															
21-1S-4E	1134		138634															
23-1S-4E	1135	2900-2928	142784															
22-2S-1E	198	2142-2228	122170	47	40585	5145	1651	21	33	72	15	1.0	80	67469	11		90	
12-2S-3E	694	2871-2875	129418	154	41425	4441	1726	11	0.0	0.2	9.0	0.0	886	76193	7.7	40	253	7.4
13-2S-4E	552	3075-3111	141062	167	44317	5719	2159	24	0.6	0.8	5.1	0.8	390	84752	35		48	7.0
34-2S-4E	1231	3061-3066	147826															
22-3S-2E	199	2742-2765	127808	103	43457	4188	1931	12	1.3		27	0.4	1216	79204	7.8		242	
6-3S-3E	559	2752-2845	135294	52	42144	5829	2042	14	0.0	0.0	10	0.6	483	80953	32		42	7.1
1-3S-4E	329	3170-3214	143800	62	45762	5058	3000	15	0.2	16	11	0.2	326	88067	17		106	6.7
27-3S-4E	677	3082-3201	147722	44	46373	6716	2871	10	6.4	8.8	13	0.0	614	88900	9.5		75	6.5
29-4S-2E	127	2895	128383	116	39390	8082	25	56	0.0		20	0.0	1235	73866	1.3	183	555	
3-4S-3E	430	2880-2907	137640	9.0	44458	4579	1851	27	0.4	1.6	16	2.0	1120	81358	5.3		62	6.7
LAWRENCE																		
20-3N-10W	681	1848-1882	82758	48	26643	2591	1534	13	0.0	0.2	14	0.0	695	49426	5.3		481	7.3
18-4N-12W	44	1565-1588	75224											43024				
16-4N-13W	542	2261-2265	90430	103	25334	6590	1570	8.0	0.0	1.2	41	0.2	1519	54286	21		146	
MARION																		
3-1N-1E	882		124490															
3-1N-1E	883	1894-1928	125658	41	39830	4732	1999	13	0.0	0.0	33	0.0	277	74852	9.0		168	6.8
3-1N-1E	885		125688	41	38545	5795	1897	4.0	8.0	40	36	2.0	285	75035	18		41	5.8
11-1N-3E	1153	2715-2735	137458															
25-1N-3E	1152	2734-2763	137352															
25-1N-3E	1155	2690-2741	136580															
32-2N-2E	144		124326	31	40412	4981	1640	17	3.6		21	2.0	80	75856	43		41	
34-2N-2E	148	2105-2134	125930	64	40687	4991	1987	4.0	0.0		17	0.0	794	76776	6.0		207	
14-2N-4E	638	2860-2886	138802	73	43382	4202	2755	18	1.6	1.6	17	0.0	156	82184	14		138	7.2
33-3N-2E	166	2137-2149	123770											76141				
33-3N-2E	167	2147-2158	125278	57	42193	2769	2464	18	0.8		17	0.0	0	77142	20		164	
33-3N-2E	168	2140-2146	123738											76518				
16-3N-4E	708	2486-2520	130564	77	40689	4625	2073	23	0.0	0.4	8.0	0.3	560	76519	8.9		304	5.3
28-4N-1E	69	1600-1604	104810		34530	3492	1462	5.0	0.2			0.5	989	62900				
RICHLAND																		
2-2N-8E	812	2998-3080	142082															
17-2N-10E	792	3178-3211	132722	52	40038	6791	2237	22	0.0	0.6	15	0.0	2067	78858	11		89	7.1
26-2N-10E	521	3252-3257	122138	103	35288	5495	2071	13	0.0	0.0	24	0.0	1769	68665	12	17	313	
26-2N-10E	909	3262-3267	122948															
7-2N-11E	939	3268-3283	130470	33	38136	6413	2155	23	0.0	0.0	50	0.0	1724	75172	9.0		78	6.8
21-2N-14W	376	3049-3069	121670	46	35233	6322	2282	12	0.2	2.4	11	0.0	1961	70778	1.3		49	6.4
21-2N-14W	1229	3066-3100	124206															
29-2N-14W	271	3109-3131	116800	95	35596	5603	2047	10	0.0	0.0	18	0.0	2184	68474	12	149	1175	
11-3N-9E	1025		131542															
19-3N-9E	801	2975-3020	143332	72	42780	6906	1989	4.0	0.0	11	19	0.6	1750	82820	8.9		39	6.1
16-3N-10E	894	3095-3103	125552	31	39856	4064	2494	12	0.0	0.0	42	0.0	1436	74646	0.0	48	337	7.4
34-3N-14W	249	3114-3129	114934	10	36740	3965	2310	20	0.0	0.0	19	0.0	563	69585	7.1	122	459	

FORMATION COUNTY LOCATION	Lab. No.	Depth	Total Solids	NH_4	Na	Ca	Mg	SiO_2	Fe Fil-tered	Fe Unfil-tered	Al_2O_3	Mn	SO_4	Cl	NO_3	CO_3	HCO_3	pH
RICHLAND—Cont'd																		
34-4N-9E	815	2950-2956	134422															
4-4N-10E	956	2890-2903	131146	41	40903	5746	2043	14	0.0	8.0	10	0.0	1946	77780	19		68	6.8
4-4N-10E	959	2889-2924	130328															
13-4N-10E	664	3065-3082	132650	52	41826	5770	1983	18	0.0	46	26	0.0	33	78550	16	244	1048	8.0
25-4N-10E	1089	3151-3162	134464															
26-4N-10E	141	3116-3132	131170	39	40605	6672	2131	43	0.0		30	1.0	1487	79389	0.6		374	
6-4N-14W	282	3026-3041	132088	67	41408	3954	2904	19	0.0	0.0	27	0.0	243	78979	35	55	332	7.3
10-4N-14W	771	2959-2997	123984															
SALINE																		
20-7S-6E	991	3188-3212	126258	26	37969	6670	1960	11	0.0	0.0	63	0.0	1730	74762	27		59	6.7
20-7S-7E	1186	3213-3227	129498															
SANGAMON																		
15-15N-3W	567	825-880	67330	26	22581	1895	913	10	0.0	4.0	3.0	0.0	1574	39561	8.9		175	
WABASH																		
4-1N-13W	220	2670-2708	95500	62	29870	4408	1629	17	0.4	8.8	20	1.2	2562	56523	2.8	61	415	
6-1N-13W	659	2801-2832	109734	44	33843	4746	2119	18	0.0	2.4	15	0.0	2311	64789	14	108	429	7.7
36-2N-14W	660	2900-2903	107424	51	33048	4024	2523	22	0.2	0.2	20	0.4	524	64412	9.2	75	1175	7.6
17-1S-12W	442	2325-2361	94770	13	30480	2727	1927	20	0.0	0.0	19	0.0	321	56459	5.3	71	1170	7.0
26-1S-13W	218	2648-2655	107640	77	34009	4578	1972	20	1.6	4.0	22	0.0	1503	64989	8.1		586	
11-2S-13W	175	2695-2714	112010	51	34646	5275	1939	17	0.0	0.0	7.0	0.2	1856	67044	20		139	
7-2S-13W	150	2865-2881	133068	44	41005	6023	2673	7.0	0.0		25	0.0	1609	80510	18		95	
7-2S-13W	600	2865-2881	134300	64	40048	6370	2210	6.0		0.2	12		1329	78578	7.0		56	7.3
7-2S-13W	820	2865-2881	135508															
WAYNE																		
16-1N-5E	972	2999-3007	145610	41	45452	6543	2045	14	0.0	16	42	1.0	1132	86815	19		54	5.9
29-1N-5E	955	2901-2906	144056	31	39770	10350	2114	35	16		42	4.0	1185	84808	23		261	5.9
9-1N-6E	551	3191-3322	144442	309	44864	6800	1852	13	0.0	0.0	28	0.6	1803	85738	11		252	7.0
25-1N-6E	1162	3229-3256	150484															
33-1N-6E	270	3200-3300	153290	64	44428	9701	2342	13	8.0	40			1439	91497	9.6		106	
9-1N-7E	1223	3157-3180	144838															
15-1N-7E	834	3128-3138	148640															
17-1N-7E	693	3168-3180	144084	41	44493	5464	2503	24	0.6	1.0	14	0.0	560	85075	5.3		90	6.7
1-1N-8E	1163	3100-3150	139906															
27-1N-8E	1210	3063-3081	138852															
31-1N-8E	833		142020															
5-1N-9E	536	3208-3270	143962	77	45628	6180	2063	14	0.0	0.0	16	0.0	1897	85846	25	36	27	7.0
35-2N-5E	930	2953-2960	142194	64	44923	5740	2173	15	0.0	20	11	2.0	329	85569	0.0		61	6.6
23-2N-7E	835	3048-3057	140964															
32-2N-8E	333	3037-3108	145526	71	46054	6453	1942	11	16	64	14	0.2	1917	86754	5.0		99	5.6
35-2N-8E	1160	3076-3087	141190															
28-1S-5E	1136	3135-3172	149352															
33-1S-5E	697	3091-3108	150222	52	46873	5744	2584	8.0	2.0	2.8	5.0	0.2	285	89783	7.4		73	6.3
21-1S-6E	1164	3178-3183	144936															
23-1S-6E	993	3177-3193	154056															
26-1S-6E	995	3226-3254	150980															
34-1S-6E	352	3151-3215	145216	77	46638	6670	1839	0.0	3.0	10	24	0.0	1378	88167	19		68	6.0
3-1S-7E	687	3150-3170	146574	58	44727	5010	3335	12	0.0	9.0	10	0.3	179	87397	2.1	12	289	7.7
3-1S-7E	1019	3150-3170	150000															
23-1S-7E	444	3202-3275	148900	46	46471	5794	1912	17	0.4	4.0	5.4	0.0	1966	86061	3.5		93	5.8
30-1S-7E	334	3242-3263	148844	85	47225	4906	3044	18	0.0	32	6.0	0.2	95	90326	36		210	7.2
35-1S-7E	1118	3201-3208	145958															
4-1S-8E	831	3122-3269	143444															
15-1S-8E	976	3208-3234	146808	46	43367	4042	3306	32	0.0		25		323	83487				7.7
19-1S-8E	1165	3278-3290	145510															
23-1S-8E	202	3167-3206	140354	67	44898	5591	2612	42	1.7	3.4	38	0.0	862	86183	31		54	
30-1S-8E	673	3326-3345	140822	35	44636	5176	2665	16	0.0		4.0	0.0	585	85295	11		407	8.4
28-1S-9E	982	3292-3296	137604	31	42270	6101	2184	35	0.0	0.0	30	0.0	1843	80970	27		81	7.4
12-2S-6E	351	3304-3348	151478	103	43646	9575	2964	0.0	0.0	0.2	19	0.0	985	92149	12		356	7.2
13-2S-6E	446	3308-3335	152750	64	47454	4793	3459	19	0.0	1.4	14	0.0	304	90540	0.0	2	112	7.4
1-2S-7E	825	3322-3329	147244															

2-2S-7E	347	3207-3236	146154	51	42022	10620	2224	27	100	100	16	0.0	1275	89078	9.3		247	
6-2S-7E	1015	3334-3343	148010															
11-2S-7E	322	3316-3330	149590	1.1	46187	5670	2613	17	0.0	1.2	15	0.0	716	88075	5.7		447	7.4
11-2S-7E	823	3316-3330	150828															
29-2S-7E	174	3394-3408	146220	52	44700	7432	2411	8.0	2.8	12	14	0.6	1294	88168	17		120	
31-2S-8E	684	3374-3385	162796	167	49353	7130	2402	16	0.0	0.6	13	0.0	82	95381	64		136	7.2
31-2S-8E	816	3374-3385	163106															
9-2S-9E	597	3317-3392	135763	31	41867	6467	1720	14	4.4	14	33	1.0	1638	79815	6.0		84	5.6
15-2S-9E	177	3262-3321	134670	41	41105	6383	2260	13	16	18	19	0.2	1956	79820	17		121	
15-2S-9E	1053	3271-3290	133074															
23-2S-9E	1052	3274-3281	125552															
27-2S-9E	1054	3324-3350	127200															
30-2S-9E	980	3318-3345	138934															
33-2S-9E	986	3308-3327	129186															
34-2S-9E	1055	3364-3374	125900															
36-2S-9E	1184	3372-3382	124582															
7-3S-6E	1215	3336-3347	149798															
12-3S-7E	910	3377-3400	152424															
4-3S-8E	223	3487-3496	139812	45	43435	6718	2340	9.0	1.6	16	22	0.2	1798	84369	4.6		122	
4-3S-9E	981	3298-3344	132010															
8-3S-9E	193	3461-3485	139700	64	37522	12550	1302	20	4.6	12	68	2.2	577	83504	71		17	
16-3S-9E	978	3380-3384	133400															
WHITE																		
34-3S-9E	1111	3430-3448	127770															
34-3S-9E	1115	3362-3430	129150															
35-3S-9E	1117	3438-3445	128264															
24-3S-10E	1040	3140-3153	126296															
24-3S-10E	1041		124494															
2-4S-9E	293	3387-3391	126140	62	38367	6361	2004	11	0.4	1.8	30	0.0	1897	74937	11		63	6.4
7-4S-9E	774	3416-3424	134612	44	38885	7555	2426	26	29	44	13	0.4	1666	79153	18		106	6.4
7-4S-10E	754	3206-3228	129834	64	39649	5772	2026	17	0.0	0.0	10	0.0	1785	75945		49	81	8.1
25-4S-10E	362	3074-3091	129100	61	40280	5920	2313	7.0	0.0	4.0	17	0.0	2166	77806	13		60	7.2
6-4S-11E	734	3035-3060	128202	41	37798	6211	2043	11	0.2	8.0	31	0.2	2027	73753	8.9		101	6.3
7-5S-9E	893	3230-3305	137726	31	41670	6693	253	6.0	0.0	0.0	36	0.0	1726	82222	18		50	6.7
36-5S-9E	1180	3142-3167	133544															
25-5S-10E	368	3022-3069	127024	23	26704	18430	1191	2.0	200	300	25	0.0	854	75857	3.5		1466	5.7
12-6S-8E	201	3058-3109	119572	44	39485	3905	1678	27	0.8	2.5	13	0.0	1561	71564	26		66	
17-7S-8E	1020	3050-3054	130948															
POSEY, INDIANA																		
34-4S-14W	339	2875-2901	106308	26	35532	3813	1006	1.0	0.4	50	26	1.2	7	64498	3.5	10	5	
ST. LOUIS																		
CLINTON																		
31-3N-3W	1064	1204-1217	49466															
EFFINGHAM																		
15-6N-6E	146	2730-2985	127882	44	41676	4593	2172	5.0	0.0		14	0.2	521	78364	7.1		88	
JEFFERSON																		
25-4S-2E	196	2910-3039	126940	62	38786	6461	2106	8.0	13	18	63	1.6	1908	76070	5.0		27	
PERRY																		
5-6S-1W	61	1860-1875	111320	71	36412	3701	1650	2.0	50		0.0		924	66900				
SALEM																		
CRAWFORD																		
29-7N-13W	682	1792-1816	73992	45	23700	1956	1186	12	0.0	0.0	10	0.0	855	42441	5.3		808	6.5
18-8N-12W	101	1888	67139		21445	2307	1013	5.0	12		78	2.0	4096	36976	24		215	
EDGAR																		
22-13N-12W	93	1205-1430	108146											63262				
PIATT																		
17-18N-6E	102	1391-1420	59993		20450	1335	582	2.0			14	1.0	61	35469	20		175	
RICHLAND																		
3-3N-9E	1024	3450-3600	118208															

FORMATION COUNTY LOCATION	Lab. No.	Depth	Total Solids	NH_4	Na	Ca	Mg	SiO_2	Fe Filtered	Fe Unfiltered	Al_2O_3	Mn	SO_4	Cl	NO_3	CO_3	HCO_3	pH
DEVONIAN-SILURIAN																		
BOND																		
31–4N–2W	124	2504–2515	56952	12	17561	2024	877	3.0	10		94	2.0	42	33177	2.0		36	
10–6N–2W	230	2300–2307	59814											36901				
16–6N–2W	897	2278–2283	48398	15	14782	1902	844	12	0.0	0.0	31	0.0	0	28520	9.0		223	6.9
CHAMPAIGN																		
9–17N–10E	90	1065	8710											3505				
10–17N–10E	119	690–1120	6265											3286				
10–17N–10E	129	1060–1540	4824		1711	97	23	30	0.2		13	0.0	38	2361	11		832	
20–20N–8E	114	322–610	5792	3	2235	21	28	8.0	0.0		0.0	0.0	12	3199	5.7		621	
20–20N–8E	125	610–655	5870	1	2061	66	47	12	2.0		6.5	0.0	46	3125	8.0		467	
CHRISTIAN																		
15–13N–1E	898	2312–2332	135796	62	40993	6626	2409	5.0	0.0	32	33	1.0	635	81545	27		27	5.2
15–13N–1E	900	2316–2325	134124															
15–13N–1E	908	2316–2337	134020															
29–13N–1E	735	2325–2356	136100	103	40814	6955	2259	15	6.0	20	11	1.8	278	81702	23		127	6.6
29–13N–1E	756	2325–2356	138260															
27–15N–2W	369	1884–1905	126250	129	39962	5512	2110	0.0	0.6	10	17	0.0	107	77681	12		20	6.4
CLARK																		
20–11N–10W	911	2064–2100	11994	8.0	3763	329	196	5.0	0.0	0.0	0.0	0.0	193	6603	44		349	7.7
17–11N–14W	140	1207	14239											8381				
30–11N–14W	670	1320–1350	17976	13	5966	483	242	21	9.6	18	10	0.0	0	10314	5.7		764	6.9
30–11N–14W	683	1400–1550	14288	12	4775	286	208	2.0	88	120	84	2.4	140	8369	5.4		35	5.9
CLAY																		
4–2N–8E	272	4702–4840	130776	206	41857	5580	1302	5.0	0.0	4.8	19	0.0	1314	77553	24	61	11	
CLINTON																		
13–1N–1W	178	2906–2915	76668	67	24478	2816	1309	14	2.2	6.7	14	0.0	157	46453	34		139	
4–1N–3W	203	2406–2432	105300	58	31749	5354	2089	33	4.2	107	32	0.6	393	64300	30		44	
20–1N–3W	619	2473–2516	107300	64	32726	5857	1913	17		0.6	9.0		413	66175	13		71	6.9
20–1N–3W	676	2470–2478	105736	64	31856	5327	1982	10	3.6	11	4.0	0.6	296	64161	7.4		61	6.6
23–1N–3W	1141		104602															
1–2N–4W	1060	2238–2278	77574															
35–3N–2W	266	2570–2684	40568	31	12927	1475	563	36	36	76	3.0	1.6	102	23881	5.0		489	
31–3N–3W	1057	2227–2251	76450															
COLES																		
11–12N–7E	594	3153–3165	40220	21	13116	1477	561	20	0.0	0.2	21	0.0	54	24365	2.8		179	6.6
11–12N–7E	709	3160–3172	40482	2.1	13800	133	449	23	6.4	6.4	17	0.6	364	22478	6.0		117	5.0
11–12N–7E	710	3160–3172	45744											26130				
35–14N–7E	433	2940–2964	28540	20	9328	889	402	51	0.0	0.0	10	0.2	207	16915	1.8	28	114	8.0
26–14N–9E	331	1052–1055	5570	3.6	2112	50	30	17	0.0	4.8	5.0	0.0	33	3012	1.4	60	618	8.1
36–14N–10E	138	1530–1535	16531	5.9	5555	376	342	9.0	0.0		0.0	0.0	169	10020	9.6		156	
30–14N–14W	107	948–968	15704	3.0	5085	410	214	57	0.0			0.0	15	8850	8.0		570	
30–14N–14W	111	948–1058	14679	1.8	4620	360	246	1.0	0.8		10	0.0	7	8236	1.0		410	
31–14N–14W	75	1075–1078	14432	0.3	5002	466	4	10	0.2		8.0		52	8467	7.1	11	45	
CRAWFORD																		
9–6N–13W	275	2795–2965	72972	72	22912	2737	1192	13	0.0	2.0	10	0.0	3375	40966	25		546	
EDGAR																		
22–13N–12W	94	2209–2235	45456											26041				
3–13N–13W	966	1340–1410	46134	10	15354	1261	506	13	8.0	640	32	2.0	372	27044	19		129	7.6
FAYETTE																		
7–8N–1E	481	2788–2814	72040											43320				
21–8N–3E	319	3054–3060	93118	0.0	29195	3668	1544	31	0.4	8.0	13	0.0	120	55679	5.7		401	6.6
29–8N–3E	318	3095–3097	90180	0.0	28357	3437	1564	40	0.1	0.1	17	0.0	67	54058	4.3		437	6.8
FULTON																		
19–5N–4E	305	760–845	3098	26	1092	44	24	16	0.6	16	1.0	0.0	214	1231	17		831	7.8
JEFFERSON																		
35–2S–1E	763	3663–3746	84480	72	27223	3149	1078	17	0.6	1.2	7.0	0.2	78	50495	11		248	6.7

LOGAN																		
7–19N–3W	896	1207–1370	12918	5.0	4757	56	117	6.0	0.0	0.0	7.0	0.0	0	7491	9.0	28	439	8.0
MADISON																		
3–4N–6W	618	1736–1781	56240	26	17983	2296	955	19	0.2	0.2	8.0		256	34234	3.5		343	7.1
4–4N–6W	604	1739–1762	56020	18	17107	3144	873	13	11	45	32	3.8	403	34199	3.5		37	4.9
4–4N–6W	608	1762–1775	59542											35278				
4–4N–6W	614	1741–1800	60152											35748				
9–4N–6W	613	1677–1690	60656											35346				
9–4N–6W	615	1747–1791	58190	23	18393	2244	981	51		1.0	8.0		118	34926	6.0		378	7.0
10–4N–6W	611	1754–1789	58012											34209				
11–4N–6W	609	1738–1762	58960											34737				
14–4N–6W	617	1754–1793	57330	22	17620	2270	998	13		2.2	8.0		369	33682	8.1		306	7.1
15–4N–6W	439	1736–1802	55800	26	17555	2259	976	18	0.0	0.6	4.0	2.0	528	33350	0.0		378	7.1
16–4N–6W	610	1720–1750	61206											36058				
16–4N–6W	612	1712–1717	62116											36489				
17–4N–6W	616	1706–1710	60152	44	18713	2577	1064	30	0.6	24	9.0	0.8	757	35768	18		453	7.3
MARION																		
3–1N–1E	1213	3260–3344	103004															
8–2N–1E	155	2992–2994	86680	59	27674	3875	1324	21	0.0		19	0.0	29	53279	5.7		342	
34–3N–2E	692	3510–3546	124618	62	38471	5781	1677	22	0.2	6.0	22	0.4	332	74218	5.3	4	89	6.8
29–4N–1E	358	2879–2908	75938	61	24255	3124	1141	26	0.2	0.2	18	1.2	50	46188	96		167	7.3
MASON																		
19–21N–5W	584	1100–1336	7772		2786	28	51	8.0	0.0		4.0	0.0	231	4260		21	382	
McDONOUGH																		
15–4N–4W	123	495	4359	2.0	1618	24	25	27	0.0		26	0.0	7	2235	5.3		636	
15–4N–4W	186	480	4640	1.8	1734	56	23	9.5	0.9	11	0.6	0.1	23	2503	0.7		551	
19–4N–4W	120	496	4701	1.8	1755	19	24	65	0.0		3.0	0.0	10	2284	5.3		894	
McLEAN																		
28–22N–1E	236	1449–1650	4428											2075				
MORGAN																		
22–13N–8W	711	1020–1039	30584	15	9801	579	308	18	0.0	20	8.0		0	16635	7.1		721	7.3
PEORIA																		
17–8N–6E	189	981–1000	2638	1.1	934	35	16	51	9.2	39	3.9	0.0	308	955	1.4		634	
4–11N–8E	750	548–1085	2148											90				
PIATT																		
6–19N–5E	1007	1206–1382	6470															
PIKE																		
12–3S–2W	967	425–510	9764	8.0	3380	107	46	15	0.0	16	13	0.0	0	5262	9.0		489	8.4
SANGAMON																		
10–15N–3W	953	1761–1777	99582															
TAZEWELL																		
18–25N–3W	136	1200–1390	3208	0.2	1208	7	5	6.0	0.0		0.0	0.0	109	1591	3.7		372	
WASHINGTON																		
23–1S–1W	605	3116–3150	79584	44	24818	4154	1139	10	0.4	0.6	8.0		742	48358	6.0		192	7.0
15–1S–4W	1138	2348–2386	103188															
15–1S–4W	1139	2308–2335	105426															
10–2S–2W	1174	3047–3080	103000															
20–3S–4W	737	2267–2284	84908	35	25122	4277	1553	16	0.0	4.0	2.0	0.2	827	50232	8.9		63	6.5
KNOX, INDIANA																		
23–1N–10W	118	3308–3415	142323	50	42746	8952	2466	4.0	0.0		58	0.0	426	88562	21		259	
SULLIVAN, INDIANA																		
30–9N–8W	746	2021–2025	11718	13	3629	446	203	26	0.0	0.4	7.0	0.0	7	6594	12		678	7.5
19–9N–9W	759		18278	21	5319	969	323	12	0.0	0.4	8.0	0.1	226	10363	8.0		642	7.3
5–9N–10W	786	2158–2187	29142	36	8847	1182	528	23	0.0	0.8	6.0	0.0	77	17096	11		305	7.1
VIGO, INDIANA																		
15–10N–10W	82	2115–2168	14033		4715	675	237	2.0	0.0		6.0	1.0	58	8761			606	
15–10N–10W	86	2089	18117											10078				
15–10N–10W	87	2115	18686											10653				
15–10N–10W	159	2022–2171	14010	13	4483	500	260	14	0.0		10	0.0	12	8241	3.2		569	
16–10N–10W	68	2103–2190	13538											7811				
16–10N–10W	84	2094	15898											9312				
24–11N–8W	765	1621–1641	3840	10	1390	51	52	17	0.0	0.0	3.0	0.0	25	2018	3.5		631	7.5
11–11N–9W	760	1782–1810	4938	5.2	1706	152	0	30	0.0	2.8	1.0	0.0	91	2773		55		
11–11N–9W	761	1681–1704	6184	62	2010	224	85	11	0.0		4.0	0.0	4	3273			819	7.6

FORMATION COUNTY LOCATION	Lab. No.	Depth	Total Solids	NH_4	Na	Ca	Mg	SiO_2	Fe Fil-tered	Fe Unfil-tered	Al_2O_3	Mn	SO_4	Cl	NO_3	CO_2	HCO_3	pH
HENDERSON, KENTUCKY																		
22–Q–25	126	4290	169710	27	50710	8306	2271	4.0	2.0		56	0.0	466	100034	4.8		112	
"TRENTON" (KIMMSWICK, GALENA)																		
BOND																		
16–6N–2W	646	3165–3193	22276	11	6207	1285	454	14	0.2	1.6	8.0	0.0	1353	12045	2.1		241	7.1
11–6N–5W	80	3068–3101	6917		2014	328	143	7.0			2.0		614	3464			318	
11–6N–5W	81	2980–3101	6891		2033	343	154	4.0			1.0		512	3666			251	
CLARK																		
9–11N–14W	192	2440–2450	86666	82	25128	5123	1825	12	0.0	0.8	13	0.2	38	52863	177		519	
CLINTON																		
26–2N–1W	1143	3994–4073	91122															
26–2N–1W	1144		93716															
28–2N–1W	747	4007–4071	85558	67	28169	2553	1286	25	0.0	0.0	16	0.2	377	51244	11		520	7.1
34–2N–1W	1146	3983–4063	90804															
COLES																		
36–14N–10E	139	2050–2055	23618	17	7889	522	438	13	0.0		16	0.0	26	14268	8.0		176	
FULTON																		
19–5N–4E	306	1097–1105	2296											488				
17–6N–1E	443	666–1130	2080	0.3	567	53	73	22	0.0	2.0	14	0.0	753	452	7.1		290	7.5
HANCOCK																		
12–4N–9W	43	672–722	1387	1.5	344	47	40	46	55		4.2	0.1	357	214		14	410	
JACKSON																		
11–7S–4W	490	3422–3488	87748		22301	6701	1781	30	10	30	11	0.4	1315	50197			468	7.9
11–7S–4W	491	3432–3550	82020											47744				
LOGAN																		
7–19N–3W	912	1702–1813	3308											1790				
MADISON																		
27–3N–6W	343	2299–2337	21254	8.2	5924	1020	481	12	0.6	2.0	9.1	0.0	958	11440	6.2	17	347	7.6
MARION																		
30–2N–2E	690	4638	124704	41	40716	4351	1322	20	100	135	7.0	3.0	293	74168	12		15	5.5
McDONOUGH																		
2–4N–4W	321	650–782	4006	2.4	1453	70	45	16	0.0	0.4	1.0	0.0	58	1893	4.2		964	7.7
MONROE																		
35–1S–10W	188	450–480	15300	4.2	4277	855	358	10	0.3		8.6	0.0	863	8345	2.1		305	
35–1S–10W	1177	463–536	14652										393	7540				
PERRY																		
23–4S–4W	949	3623–3735	138264	46	41829	7481	1830	12	4.0	24	0.0	1.0	971	82376	9.0		107	6.2
PIKE																		
14–5S–6W	335	474–552	1088											350				
ST. CLAIR																		
28–1N–10W	45	666–702	17784											9800				
28–1N–10W	154	397–440	18596	5.5	5217	1251	431	31	0.2		11	0.0	880	10687	3.9		320	
28–1N–10W	263	385–532	16114	5.2	4283	946	374	11	0.0	0.0	27	0.0	457	8873	7.8		282	
33–1N–10W	46	582–644	19781											10903				
33–1N–10W	47	556–582	20260											11137				
33–1N–10W	215	638–700	18680											10580				
33–1N–10W	268	638–700	18672	4.6	5039	1104	379	8.0	32	80	0.0	0.6	793	10099	4.2		259	
33–1N–10W	951	650	21816											12213				
TAZEWELL																		
8–23N–6W	576	1220–1458	2404											410				
ST. PETER																		
ADAMS																		
11–2S–6W	294	344–971	8210	3.6	2443	319	157	36	0.4	1.0	11	0.0	992	3876	9.6	10	292	7.4
26–2S–8W	302	666–675	12258	5.2	3715	456	266	22	0.8	0.8	6.0	1.3	987	6398	8.1		328	7.2
BOND																		
12–6N–5W	134	2505–3154	12201	13	3563	583	260	6.0	0.0		332	0.0	1614	5973	32		217	

CLARK																		
6-11N-11W	225	3945-3960	124550	142	37346	6778	2418	5.0	40	128	81	3.0	121	76000	13		7	
8-11N-14W	67	2923-3009	24114		6941	1551	494	33	0.8		0.9	0.0	2618	12563			678	
CRAWFORD																		
35-6N-13W	295	4650-4654	160730	41	44295	11260	2306	32	0.0	0.4	37	1.2	945	94257	21		110	6.3
DOUGLAS																		
36-16N-8E.	509	1570	24864		6489	1112	464	65	0.0	0.0	34	0.0	1286	12178			280	
36-16N-8E.	510	1644	25176		5306	1245	1037	26	3.0	19	0.0	4.2	1538	12106			237	
EDGAR																		
3-13N-13W	1008	2987-2997	48179															
HENDERSON																		
17-9N-4W	163	934-1235	1623	0.2	386	105	46	7.5	0.0		1.3	0.0	659	269	6.7		266	
JERSEY																		
27-8N-10W	162	1304-1802	9040	3.1	3256	97	101	4.0	0.0		9.0	0.4	254	5234	2.8		117	
MACON																		
30-17N-2E.	108	2937-2941	6480											3378				
30-17N-2E.	109	2937-2941	8118	2.0	2382	415	128	10	0.8		9.0	0.0	399	4245	7.0		415	
MARION																		
4-2N-1E.	237	4270-5023	110316		34183	6006	1450	38	16	320	227	0.8	1473	66418			98	
20-2N-2E.	450	4556-5256	127050	51	39555	6862	1513	32	20	20	17	0.0	1393	76582	1.8		58	6.4
MONROE																		
35-1S-10W.	1176		15714										367	8164				
PERRY																		
5-6S-1W.	70	5143	82956		22060	4270	1289	5.0	4.0			3.0		48525			110	
5-6S-1W.	71	5171	85512		25459	4274	1307	25	40			2.0	2522	48775			47	
RANDOLPH																		
12-5S-9W	115	1382-1840	29190	8.7	7950	1814	651	11	0.0		9.0	0.0	2104	15605	7.4		375	
ST. CLAIR																		
28-1N-10W	360	890	18230	9.9	5174	868	561	15	0.6	20	17	0.2	718	10589	1.8		84	
SCHUYLER																		
5-3N-4W	1202	958-975	3528															
TAZEWELL																		
24-25N-3W	577	2038-2198	1352											404				
SHAKOPEE																		
PIKE																		
21-5S-4W.	640	914-1025	4128	1.9	1210	127	70	16	0.0	0.4	5.0	0.0	81	1657	2.5	4	63	8.2
21-5S-4W.	641	1096-1098	4199	1.7	1331	110	43	9.0	0.0	0.0	3.0	0.0	80	1681	2.5	10	144	8.0
ONEOTA																		
DOUGLAS																		
36-16N-8E.	514	2150-2170	22344		6305	1295	484	26	0.0	0.4	14	0.0	1658	12028		15	291	
TREMPEALEAU																		
DOUGLAS																		
36-16N-8E.	515	2362	22548		6304	1229	420	17	2.0	4.0	20	1.0	1643	11859			83	
FORD																		
19-24N-7E.	262	2759-2985	4098		911	607	0	10	0.0	0.0	7.0	0.0	355	1591		61	266	
FRANCONIA																		
DOUGLAS																		
36-16N-8E.	558	3090-3100	26868	13	7669	1596	572	30	0.0	0.0	17	0.0	2098	14610	35		286	
MT. SIMON																		
DOUGLAS																		
36-16N-8E.	539	4046-4060	102700	7.7	30174	6814	1302	0.0	10	10	33	11	1715	60997	1.8		240	
36-16N-8E.	540	4046-4090	128312	13	34567	10590	1916	13	13	20	77	9.4	1292	76570	11		174	7.3
WILL																		
23-36N-9E.	526	1618-1935	1210		249	28	9	12	0.2	0.2	0.3	0.0	48	400		10	19	7.0

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